

CONDENSED  
CATALOGUES  
OF  
MECHANICAL  
EQUIPMENT

1914

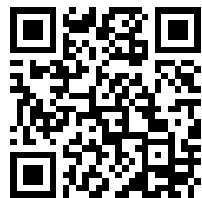
THE AMERICAN SOCIETY *of*  
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# CONDENSED CATALOGUES OF MECHANICAL EQUIPMENT

A COLLECTION OF CATALOGUE DATA CONCERNING  
THE PRODUCTS OF MANUFACTURERS  
OF MECHANICAL EQUIPMENT

FOURTH ANNUAL VOLUME  
OCTOBER 1914

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS  
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**T**HE *Fourth Annual Volume of the A. S. M. E. Condensed Catalogues of Mechanical Equipment* is furnished, like the three preceding yearly volumes, as a work of reference for the mechanical engineering profession and the machinery using field in general. The main purpose of the Condensed Catalogues is to present in highly condensed form the principal facts and details concerning the various classes of mechanical equipment, thus serving as a convenient index to the great number of individual catalogues issued by the manufacturers, and furnishing a means of ready comparison between the various makes of goods in any given line.

Previous issues have established the great practical usefulness of the Condensed Catalogues as a desk reference book of mechanical equipment, and engineers, superintendents, managers, purchasing agents and other mechanical and executive heads of industrial plants find the volume extremely valuable for purposes of preliminary reference and as a source of specific information that would often be difficult to secure by any other means.

Every effort has been made to secure representation of all leading firms in this field, and to restrict the pages of the Condensed Catalogues to manufacturers of approved standing only. The preparation of all catalogue data has been supervised in such a manner as to eliminate all exaggerated claims and misstatements, and in the main this unquestionably has been accomplished. In view of the large amount of material handled the Society cannot, however, accept responsibility for every claim and statement made.

The Classified Index has been compiled with great care and comprises a most comprehensive and representative list of mechanical equipment. Users of the volume will find this feature of special service as a guide to the names of firms in every line of manufacture of interest to the machinery using field.

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# CLASSIFIED LIST OF MECHANICAL EQUIPMENT

Manufactured by Firms Represented in this Volume

- Abrasive Materials**  
Norton Co.
- Accumulators**  
Alliance Machine Co.  
Coatesville Boiler Works  
Wood & Co., R. D.  
Worthington, Henry R.
- Aerial Tramways**  
(See Tramways, Wire Rope)
- Agitators**  
Dorr Cyanide Machinery Co.
- Air Brakes, Compressors, etc.**  
(See Brakes, Compressors, etc., Air)
- Air Cooling Apparatus**  
Webster & Co., Warren
- Air Conditioning Apparatus**  
Griscom-Russell Co.  
Webster & Co., Warren
- Air Lift Pumping Systems**  
Hall Steam Pump Co.  
Ingersoll-Rand Co.  
National Brake & Electric Co.
- Air Tanks and Cylinders**  
(See Receivers, Air)
- Air Washers**  
American Blower Co.  
Sturtevant Co., E. F.  
Webster & Co., Warren
- Alarms, Low Water**  
Lunkenheimer Co.
- Alloys**  
Allan & Son, A.  
Aluminum Co. of America  
Bayonne Casting Co.  
Lumen Bearing Co.  
Riverside Metal Refining Co.
- Alternators**  
(See Generators, Electric)
- Aluminum, Ingot**  
Aluminum Co. of America
- Aluminum, Sheet**  
Aluminum Co. of America
- Aluminum Castings, Wire, etc.**  
(See Castings, Wire, etc., Aluminum)
- Alundum**  
(See Grinding Wheels)
- Ammonia Condensers, Fittings, etc.**  
(See Condensers, Fittings, etc., Ammonia)
- Anti-Friction Metals**  
(See Metals, Anti-Friction)
- Anvil Blocks**  
Hooven, Owens, Rentschler Co.
- Arc Lamps**  
(See Lamps, Arc)
- Arches, Fire Door**  
Monarch Boiler Arch Co.
- Arches, Ignition (Flat Suspended)**  
Green Engineering Co.  
Illinois Stoker Co.
- Laclede-Christy Clay Products Co.**
- Arches, Rear Combustion Chamber**  
Monarch Boiler Arch Co.
- Asbestos Products**  
Keasbey Co., Robert A.
- Ash Handling Systems, Pneumatic**  
Green Engineering Co.
- Babbitt Metal**  
Allan & Son, A.  
Lumen Bearing Co.  
Riverside Metal Refining Co.
- Balanced Main Valves**  
(See Valves, Balanced Distribution)
- Ball Bearings**  
(See Bearings, Ball)
- Ball Cranks**  
Cincinnati Ball Crank Co.
- Balls, Brass and Bronze**  
Auburn Ball Bearing Co.  
Lunkenheimer Co.
- Ball, Steel**  
Auburn Ball Bearing Co.
- Ballast Unloaders**  
(See Unloaders, Ballast)
- Barometers**  
Tagliabue Mfg. Co., C. J.
- Barometric Condensers**  
(See Condensers, Barometric)
- Barrels, Tumbling**  
Mohr & Sons, John
- Bars, Grate**  
(See Grates and Grate Bars)
- Bearing Metals**  
(See Metals, Bearing)
- Bearing Testing Machines**  
Riehle Bros. Testing Machine Co.
- Bearings, Ball**  
Auburn Ball Bearing Co.  
Hess-Bright Manufacturing Co.  
Norma Co. of America  
Rhineland Machine Works Co.
- Bearings, Bronze**  
Allan & Son, A.  
American Brass Co.  
Lumen Bearing Co.  
Metaline Co.
- Bearings, Roller**  
Hyatt Roller Bearing Co.  
Norma Co. of America
- Bearings, Self-Oiling**  
American Tool & Machine Co.  
Brown Co., A. & F.  
Caldwell & Son Co., H. W.  
Falls Clutch and Machinery Co.  
Hill Clutch Co.

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- Plamondon Mfg. Co., A.  
Weller Manufacturing Co.
- Bearings, Thrust**  
Allan & Son, A.  
Auburn Ball Bearing Co.  
Hill Clutch Co.  
Norma Co. of America
- Belt Conveyors**  
(See Conveyors, Belt)
- Belt Fasteners**  
Jewell Belting Co.  
Main Belting Co.  
Rossendale-Reddaway Belting & Hose Co.
- Belt Lacing**  
Jewell Belting Co.
- Belt Tighteners**  
American Tool & Machine Co.  
Brown Co., A. & F.  
Caldwell & Son Co., H. W.  
Weller Manufacturing Co.
- Belting, Camel's Hair**  
Rossendale-Reddaway Belting & Hose Co.
- Belting, Chain**  
(See Chains and Chain Links)
- Belting, Coiled Wire**  
McCord Manufacturing Co.
- Belting, Conveyor**  
Boston Belting Co.  
Goodrich Co., B. F.  
Main Belting Co.  
Robins Conveying Belt Co.  
Weller Manufacturing Co.
- Belting, Leather**  
Jewell Belting Co.
- Belting, Rubber**  
Boston Belting Co.  
Goodrich Co., B. F.
- Belting, Textile**  
Boston Belting Co.  
Goodrich Co., B. F.  
Main Belting Co.  
Rossendale-Reddaway Belting & Hose Co.
- Bending and Straightening Machines**  
Williams, White & Co.
- Bending Machines, Eye**  
Williams, White & Co.
- Bending Machines, Hydraulic**  
Williams, White & Co.  
Wood Co., R. D.
- Blankets, Rubber**  
Boston Belting Co.
- Blast Furnaces, Gates, etc.**  
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- Blocks, Chain Hoisting**  
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Clyde Iron Works  
Hunt Co., Inc., C. W.  
Leschen & Sons Rope Co., A.  
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American Blower Co.  
Sturtevant Co., B. F.
- Blowers, Pressure**  
American Blower Co.  
American Gas Furnace Co.  
Nash Engineering Co.  
Roots Co., P. H. & F. M.  
Sturtevant Co., B. F.  
Worthington, Henry R.
- Blowers, Rotary**  
Nash Engineering Co.  
Roots Co., P. H. & F. M.
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Marion Machine, Foundry & Supply Co.  
Vulcan Soot Cleaner Co.
- Blowers, Steam Jet**  
Bloomsberg & Co., H.  
McClave-Brooks Co.
- Blowpipes**  
American Gas Furnace Co.
- Blowpipes, Cutting**  
Oxweld Acetylene Co.
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Oxweld Acetylene Co.
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Monarch Boiler Arch Co.
- Boiler Coverings, Furnaces, Tubes, etc.**  
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Lunkenheimer Co.
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Coatesville Boiler Works  
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Bigelow Co.  
Murray Iron Works Co.
- Boilers, Locomotive**  
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Clyde Iron Works  
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- Boilers, Marine**  
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Bass Foundry & Machine Co.  
Bigelow Co.  
Edge Moor Iron Co.  
Gas Engine & Power Co. and  
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Murray Iron Works Co.  
Wickes Boiler Co.
- Bolt-Cutting Machinery**  
Landis Machine Co., Inc.
- Bolts and Nuts**  
American Screw Co.  
Russell, Burdshall & Ward Bolt and Nut Co.
- Boring and Drilling Machines, Horizontal**  
Detrick & Harvey Machine Co.
- Boring and Turning Mills, Vertical**  
Detrick & Harvey Machine Co.
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American Brass Co.  
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Laclede-Christy Clay Products Co.
- Brick, Insulating**  
Armstrong Cork & Insulation Co.
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- Bridge Tramways**  
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- Buckets, Elevator**  
Caldwell & Son Co., H. W.  
Link-Belt Co.  
Robins Conveying Belt Co.  
Weller Manufacturing Co.
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Allan & Son, A.
- Bulldozers**  
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- Burners, Gas**  
American Gas Furnace Co.
- Burners, Oil**  
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- Cabinets and Tables, Blue-Print**  
Durand Steel Locker Co.
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- Calorimeters**  
American Steam Gauge & Valve Mfg. Co.
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Lamson Co.
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Lamson Co.
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- Carriers and Elevators, Freight, Continuous**  
Link-Belt Co.  
Robins Conveying Belt Co.  
Weller Manufacturing Co.
- Cars, Dump**  
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- Cars, Industrial Railway**  
Hunt Co., Inc., C. W.  
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American Gas Furnace Co.
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D'Este Co., Julian  
Lunkenheimer Co.
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American Tool & Machine Co.  
Bayonne Casting Co.  
Darling Pump & Mfg. Co., Ltd.  
D'Este Co., Julian  
Kelly & Jones Co.  
Lumen Bearing Co.  
Lunkenheimer Co.  
McCord Manufacturing Co.  
McClave-Brooks Co.  
Marion Machine, Foundry & Supply Co.  
Marshall Foundry Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Riverside Metal Refining Co.
- Castings, Die-Molded**  
American Brass Co.  
Lumen Bearing Co.  
Veeder Manufacturing Co.
- Castings, Iron**  
American Tool & Machine Co.  
Bass Foundry & Machine Co.  
Best Manufacturing Co.  
Brown Co., A. & F.  
Caldwell & Son Co., H. W.  
Darling Pump & Mfg. Co., Ltd.  
D'Olier Centrifugal Pump & Machine Co.  
Falls Clutch & Machinery Co.  
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Rosedale Foundry & Machine Co.  
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American Tool & Machine Co.  
Lunkenheimer Co.
- Castings, Malleable Iron**  
Kelly & Jones Co.  
Malleable Iron Fittings Co.
- Castings, Monel Metal**  
Bayonne Casting Co.  
Ruggles-Coles Engineering Co.
- Castings, Semi-Steel**  
Best Manufacturing Co.  
Caldwell & Son Co., H. W.  
D'Olier Centrifugal Pump & Machine Co.  
Hill Clutch Co.  
Hooven, Owens, Rentschler Co.  
Lunkenheimer Co.  
Malleable Iron Fittings Co.  
Murray Iron Works Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Wood & Co., R. D.
- Castings, Steel**  
Falk Co.  
Lunkenheimer Co.  
Malleable Iron Fittings Co.  
National Brake & Electric Co.
- Cement, Fire Brick**  
Betsen Plastic Fire Brick Co.
- Cement, Pipe Joint**  
Crane Co.  
Simmons Co., John
- Cement Machinery**  
Hill Clutch Co.
- Cement Testing Machines**  
Riehle Bros. Testing Machine Co.
- Centrifugals, for Sugar, Chemicals, etc.**  
American Tool & Machine Co.  
D'Olier Centrifugal Pump & Machine Co.
- Centrifugals, Clarifying and Filtering**  
D'Olier Centrifugal Pump & Machine Co.
- Centrifugals, Oil and Waste**  
American Tool & Machine Co.  
D'Olier Centrifugal Pump & Machine Co.
- Centrifugals, Sludge**  
D'Olier Centrifugal Pump & Machine Co.
- Centrifugals, Standard Electric**  
D'Olier Centrifugal Pump & Machine Co.
- Centrifugal Oil Separators**  
(See Oil Separating Machines, Centrifugal)
- Centrifugal Pumps**  
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- Chains and Chain Links**  
Caldwell & Sons Co., H. W.  
Link-Belt Co.  
Weller Manufacturing Co.
- Chain Drives**  
Link-Belt Co.
- Chain Grate Stokers**  
(See Stokers, Chain Grate)
- Chain Testing Machines**  
Riehle Bros. Testing Machine Co.
- Channelling Machines, Mine and Quarry**  
Ingersoll-Rand Co.
- Charging Machines, Furnace**  
Alliance Machine Co.
- Chimneys, Steel**  
(See Stacks, Steel)
- Chucks, Drill**  
Modern Tool Co.
- Chucks, Lathe**  
Modern Tool Co.
- Chucks, Magnetic**  
D & W Fuse Co.
- Chucks, Tapping**  
Peter Bros. Manufacturing Co.
- Chutes**  
Hunt Co., Inc., C. W.  
Link-Belt Co.  
Willcox Engineering Co., Inc.
- Circulators, Steam Heating**  
Bloomsburg & Co., H.
- Circulators, Feed Water**  
Bloomsburg & Co., H.
- Clamps, Wire Rope**  
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- Classifiers**  
Dorr Cyanide Machinery Co.
- Clay Products and Refractories**  
Laclede-Christy Clay Products Co.
- Clay Working Machinery**  
Dorr Cyanide Machinery Co.  
Marion Machine, Foundry & Supply Co.  
Williams Patent Crusher & Pulverizer Co.
- Clutches, Friction**  
American Tool & Machine Co.  
Brown Co., A. & F.  
Caldwell & Son Co., H. W.  
Falls Clutch & Machinery Co.  
Hill Clutch Co.  
Link-Belt Co.  
Moore & White Co.  
Flamondon Mfg. Co., A.  
Weller Manufacturing Co.
- Clutch Leathers**  
(See Leathers, Automobile)
- Coal and Ash Handling Machinery**  
Brown Hoisting Machinery Co.  
Caldwell & Son Co., H. W.  
Green Engineering Co.  
Hunt Co., Inc., C. W.  
Illinois Stoker Co.  
Link-Belt Co.  
Robins Conveying Belt Co.  
Weller Manufacturing Co.
- Coal Cleaners**  
Pennsylvania Crusher Co.
- Coal Crushers**  
Hunt Co., Inc., C. W.  
Link-Belt Co.  
Pennsylvania Crusher Co.  
Robins Conveying Belt Co.  
Williams Patent Crusher & Pulverizer Co.
- Coal Mining Machinery**  
Ingersoll-Rand Co.
- Coaling Stations, Locomotive**  
Brown Hoisting Machinery Co.  
Hunt Co., Inc., C. W.  
Link-Belt Co.  
Williams, White & Co.
- Cocks, Air and Gage**  
American Steam Gauge & Valve Mfg. Co.  
Crane Co.  
Detroit Lubricator Co.  
Jenkins Bros.  
Kelly & Jones Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing Co.  
Penberthy Injector Co.  
"S-C" Regulator Co.  
Simmons Co., John

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**Cocks, Blowoff**

Best Manufacturing Co.  
Crane Co.  
Homestead Valve Manufacturing Co.  
Kelly & Jones Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Pratt & Cady Co.  
Simmons Co., John

**Cocks, Three-Way and Four-Way.**

American Steam Gauge & Valve Mfg. Co.  
Best Manufacturing Co.  
Crane Co.  
Homestead Valve Manufacturing Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Pratt & Cady Co.

**Colls, Pipe**

Best Manufacturing Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Simmons Co., John  
Vilter Manufacturing Co.

**Coke Oven Machinery**

Alliance Machine Co.  
Brown Hoisting Machinery Co.

**Cold Saw Cutting-Off Machines**

(See Cutting-Off Machines, Cold Saw)

**Cold Storage Insulation**

Armstrong Cork & Insulation Co.  
Keasbey Co., Robert A.

**Cold Storage Plants**

De La Vergne Machine Co.

**Collars, Shafting**

Caldwell & Son Co., H. W.  
Hill Clutch Co.  
Plamondon Mfg. Co., A.

**Collectors, Dust**

Knickerbocker Co.  
Sturtevant & Co., B. F.

**Columns and Bases, Structural**

Marshall Foundry Co.

**Combustion Chamber Arches**

(See Arches, Combustion Chamber)

**Compressors, Air**

Blake & Knowles Steam Pump Works  
Canton-Hughes Pump Co.  
Devine Co., J. P.  
Goulds Manufacturing Co.  
Hall Steam Pump Co.  
Hooven, Owens, Rentschler Co.  
Ingersoll-Rand Co.  
Murray Iron Works Co.  
Nash Engineering Co.  
National Brake & Electric Co.  
Nordberg Manufacturing Co.  
Otto Gas Engine Works  
Roots Co., P. H. & F. M.  
Worthington, Henry R.

**Compressors, Ammonia**

Vilter Manufacturing Co.

**Compressors, Compound Air**

Hall Steam Pump Co.  
Ingersoll-Rand Co.  
Murray Iron Works Co.  
National Brake & Electric Co.  
Nordberg Manufacturing Co.

**Compressors, Gas**

Blake & Knowles Steam Pump Works  
Hall Steam Pump Co.  
Hooven, Owens, Rentschler Co.  
Ingersoll-Rand Co.  
Murray Iron Works Co.  
National Brake & Electric Co.  
Nordberg Manufacturing Co.  
Roots Co., P. H. & F. M.

**Concrete Mixing Machines**

(See Mixers, Concrete)

**Concrete Reinforcement**

Brown Hoisting Machinery Co.

**Condensation Pumps with Automatic Receivers**

(See Pumps, Condensation, with Automatic Receivers)

**Condensation Receiver and Pump Governor**

D'Este Co., Julian

**Condenser Tubes**

(See Tubes, Condenser)

**Condensers**

Coatesville Boiler Works  
Devine Co., J. P.  
Griscom-Russell Co.  
Marshall Foundry Co.  
Mohr & Sons, John  
Murray Iron Works Co.  
Nordberg Manufacturing Co.  
Struthers-Wells Co.

**Condensers, Ammonia**

De La Vergne Machine Co.  
Vilter Manufacturing Co.

**Condensers, Barometric**

Wheeler Condenser & Engineering Co.  
Wheeler Manufacturing Co., C. H.  
Worthington, Henry R.

**Condensers, Jet**

Blake & Knowles Steam Pump Works  
Cameron Steam Pump Works, A. S.  
Canton-Hughes Pump Co.  
Hall Steam Pump Co.  
Murray Iron Works Co.  
Wheeler Condenser & Engineering Co.  
Wheeler Manufacturing Co., C. H.  
Worthington, Henry R.

**Condensers, Surface**

Blake & Knowles Steam Pump Works  
Cameron Steam Pump Works, A. S.  
Griscom-Russell Co.  
Hall Steam Pump Co.  
Murray Iron Works Co.  
Wheeler Condenser & Engineering Co.  
Wheeler Manufacturing Co., C. H.  
Worthington, Henry R.

**Conduit, Electric Wire**

American Vulcanized Fibre Co.  
Diamond State Fibre Co.  
Mark Manufacturing Co.

**Controllers, Automatic, for Temperature or for Pressure**

(See Regulators)

**Controllers, Electric**

General Electric Co.

**Controllers, Feed Water**

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**Controllers, Heat**

American Gas Furnace Co.

**Converters**

Mohr & Sons, John

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- Converters, Synchronous**  
General Electric Co.
- Conveying Machinery**  
Automatic Weighing Machine Co.  
Brown Hoisting Machinery Co.  
Consolidated Tramway Co.  
Conveying Weigher Co.  
Hill Clutch Co.  
Hunt Co., Inc., C. W.  
Lamson Co.  
Link-Belt Co.  
Robins Conveying Belt Co.  
Standard Sand & Machine Co.  
Weller Manufacturing Co.
- Conveying Systems, Pneumatic (Light Material)**  
American Blower Co.  
Sturtevant Co., B. F.  
Williams Patent Crusher & Pulverizer Co.
- Conveying Weighers**  
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- Conveyors, Automatic and Special Duty**  
Lamson Co.
- Conveyors, Belt**  
Caldwell & Son Co., H. W.  
Conveying Weigher Co.  
Link-Belt Co.  
Robins Conveying Belt Co.  
Standard Sand & Machine Co.  
Weller Manufacturing Co.
- Conveyors, Belt and Tray**  
Lamson Co.
- Conveyors, Bucket, Pan or Apron**  
Caldwell & Son Co., H. W.  
Hunt Co., Inc., C. W.  
Link-Belt Co.  
Weller Manufacturing Co.
- Conveyors, Sand**  
Standard Sand & Machine Co.
- Conveyors, Screw**  
Caldwell & Son Co., H. W.  
Link-Belt Co.  
Weller Manufacturing Co.
- Cookers, Continuous**  
American Process Co.
- Cooling Towers**  
Murray Iron Works Co.  
Wheeler Condenser & Engineering Co.  
Wheeler Manufacturing Co., C. H.  
Worthington, Henry R.
- Copper, Drawn**  
American Brass Co.  
Bridgeport Brass Co.  
Roebbing's Sons Co., John A.
- Copper Converting Machinery**  
Alliance Machine Co.
- Copper Leaching Machinery**  
Dorr Cyanide Machinery Co.
- Copper Wires and Cables**  
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- Corliss Engines**  
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- Corundum**  
(See Grinding Wheels)
- Corrugated Board Container Machinery**  
Knowlton Co., M. D.
- Counters, Revolution**  
American Steam Gauge & Valve Mfg. Co.  
Root Co., C. J.  
Veeder Manufacturing Co.
- Countershafts and Belt Shifters**  
Hill Clutch Co.
- Counting Machines, Automatic**  
Root Co., C. J.  
Veeder Manufacturing Co.  
Willcox Engineering Co., Inc.
- Couplings, Flexible**  
Falls Clutch & Machinery Co.  
Hill Clutch Co.  
Hooven, Owens, Rentschler Co.  
Roots Co., P. H. & F. M.  
Williams Patent Crusher & Pulverizer Co.
- Couplings, Pipe**  
American District Steam Co.  
Best Manufacturing Co.  
Crane Co.  
Kelly & Jones Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing Co.  
Mark Manufacturing Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Pratt & Cady Co.  
Simmons Co., John
- Couplings, Shaft**  
American Tool & Machine Co.  
Brown Co., A. & F.  
Caldwell & Son Co., H. W.  
Estes, Geo. L.  
Falls Clutch & Machinery Co.  
Hill Clutch Co.  
Moore & White Co.  
Plamondon Mfg. Co., A.  
Weller Manufacturing Co.
- Couplings, Union**  
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- Covering, Boiler**  
Armstrong Cork & Insulation Co.  
Keasbey Co., Robert A.
- Covering, Pipe and Tank**  
Armstrong Cork & Insulation Co.  
Keasbey Co., Robert A.
- Covering, Steam Pipe**  
American District Steam Co.  
Armstrong Cork & Insulation Co.  
Keasbey Co., Robert A.
- Cranes, Electric Travelling**  
Alliance Machine Co.  
Brown Hoisting Machinery Co.  
Hunt Co., Inc., C. W.  
Shepard Electric Crane & Hoist Co.
- Cranes, Gantry**  
Alliance Machine Co.  
Brown Hoisting Machinery Co.  
Link-Belt Co.
- Cranes, Hand Power**  
Brown Hoisting Machinery Co.  
Clyde Iron Works  
Shepard Electric Crane & Hoist Co.
- Cranes, Hydraulic**  
Alliance Machine Co.  
Wood & Co., R. D.
- Cranes, Jib**  
Alliance Machine Co.  
Brown Hoisting Machinery Co.  
Wood & Co., R. D.
- Cranes, Locomotive**  
Brown Hoisting Machinery Co.  
Link-Belt Co.
- Cranes, Pillar**  
Brown Hoisting Machinery Co.
- Cranes, Portable**  
Brown Hoisting Machinery Co.  
Clyde Iron Works
- Crushers, Hammer**  
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West Pulverizing Machine Co.  
Williams Patent Crusher & Pulverizer Co.
- Crystolon**  
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- Cupolas**  
Bigelow Co.  
Mohr & Sons, John
- Cups, Oil and Grease**  
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- Cutters, Bolt**  
Landis Machine Co., Inc.
- Cutters, Oxy-Acetylene**  
Oxweld Acetylene Co.
- Cutters, Paper Tube**  
Knowlton, M. D.
- Cutters, Pipe and Tube**  
Borden Co.  
Mark Manufacturing Co.
- Cutting Machines, Paper and Card-board**  
Knowlton Co., M. D.
- Cutting-Off Machines, Cold Saw**  
Earle Gear & Machine Co.
- Cyaniding Equipment**  
Dorr Cyanide Machinery Co.
- Cyclometers**  
Veeder Manufacturing Co.
- Cylinders, Pump**  
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- Damper Regulators**  
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- Derricks and Derrick Fittings**  
Brown Hoisting Machinery Co.  
Clyde Iron Works
- Destructors, Refuse**  
Griscom-Russell Co.
- Dewaterers**  
Dorr Cyanide Machinery Co.
- Die Blocks**  
Colonial Steel Co.
- Die Castings**  
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- Die Making**  
Colonial Steel Co.
- Die Sinkers**  
Bliss Co., E. W.
- Die Stocks**  
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- Dies, Punching**  
Bliss Co., E. W.
- Dies, Screw and Thread Cutting**  
Geometric Tool Co.  
Ideal Tool & Manufacturing Co.  
Jones & Lamson Machine Co.  
Landis Machine Co., Inc.  
Modern Tool Co.
- Dies, Self-Opening**  
Geometric Tool Co.  
Ideal Tool & Manufacturing Co.  
Jones & Lamson Machine Co.  
Landis Machine Co., Inc.  
Modern Tool Co.
- Dies, Sheet Metal Working**  
Bliss Co., E. W.
- Dies, Stamping**  
Bliss Co., E. W.
- Digesters**  
American Process Co.  
Bigelow Co.  
Coatesville Boiler Works
- Digesters, Pulp**  
Hooven, Owens, Rentschler Co.
- Discs, Rubber**  
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- Discs, Steel**  
Auburn Ball Bearing Co.
- Discs, Valve**  
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- Disintegrators**  
Williams Patent Crusher & Pulverizer Co.
- Ditches, Railroad**  
Marion Steam Shovel Co.
- Draft, Mechanical**  
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- Drainage Systems**  
Morehead Manufacturing Co.
- Dredges, Dipper**  
Marion Steam Shovel Co.
- Dredges, Hydraulic**  
Marion Steam Shovel Co.  
Morris Machine Works
- Dredges, Placer Mining**  
Marion Steam Shovel Co.
- Drilling Machines, Multiple Spindle**  
Reed-Prentice Co.  
Windsor Machine Co.
- Drilling Machines, Pneumatic**  
Ingersoll-Rand Co.
- Drilling Machines, Radial**  
Reed-Prentice Co.
- Drilling Machines, Rock**  
Ingersoll-Rand Co.
- Drilling Machines, Sensitive**  
Reed-Prentice Co.
- Drilling Machines, Vertical**  
Reed-Prentice Co.
- Drop Forgings, Hammers, Presses etc.**  
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- Dry Cleaning Systems**  
Hydraulic Oil Storage Co.
- Dry Kilns**  
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- Dryers**  
American Process Co.  
Bigelow Co.  
Coatesville Boiler Works  
Devine Co., J. P.  
Ruggles-Coles Engineering Co.  
West Pulverizing Machine Co.
- Dryers and Bonding Machines, Sand**  
Standard Sand & Machine Co.
- Dryers, Direct Heat**  
American Process Co.  
Coatesville Boiler Works  
Ruggles-Coles Engineering Co.
- Dryers, Steam Jacketed**  
Coatesville Boiler Works
- Dryers, Vacuum**  
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American Process Co.  
Devine Co., J. P.

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- Koven & Brother, L. O.  
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- Drying Stoves**  
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- Dump Cars**  
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- Dust Collectors**  
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- Dust and Weather Proofing Strips,**  
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- Dynamos**  
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- Economizers, Fuel**  
Sturtevant Co., B. F.
- Ejectors**  
Lunkenheimer Co.  
Penberthy Injector Co.
- Electric Generators, Hoists, Trucks,**  
Welding, etc.  
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Welding, etc., Electric)
- Electrical Instruments**  
General Electric Co.
- Electrical Machinery**  
General Electric Co.  
National Brake & Electric Co.
- Elevating and Conveying Machinery**  
Caldwell & Son Co., H. W.  
Hill Clutch Co.  
Link-Belt Co.  
Robins Conveying Belt Co.  
Weller Manufacturing Co.
- Elevators, Inclined**  
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- Elevators, Sand**  
Standard Sand & Machine Co.
- Emery Wheels**  
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- Emery Wheel Dressers**  
Norton Co.
- Engineers and Contractors**  
American District Steam Co.  
Griscom-Russell Co.  
Murray Iron Works Co.  
Peterson Engineering Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Ruggles-Coles Engineering Co.  
West Pulverizing Machine Co.  
Willcox Engineering Co., Inc.,
- Engine Stops**  
Martell Packings Co.  
Nordberg Manufacturing Co.
- Engines, Automatic**  
American Blower Co.  
Ball Engine Co.  
Murray Iron Works Co.  
Reeves-Cubberley Engine Co.  
Skinner Engine Co.
- Engines, Blowing**  
Hooven, Owens, Rentschler Co.  
Nordberg Manufacturing Co.
- Engines, Corliss**  
Ball Engine Co.  
Bass Foundry & Machine Co.  
Fitchburg Steam Engine Co.  
Fulton Iron Works  
Hooven, Owens, Rentschler Co.  
Murray Iron Works Co.
- Nordberg Manufacturing Co.  
Reeves-Cubberley Engine Co.  
Vilter Manufacturing Co.
- Engines, Gas and Gasoline**  
Blount Engineering Co.  
De La Vergne Machine Co.  
Gas Engine & Power Co., and  
Charles L. Seabury & Co.,  
Cons.  
Hooven, Owens, Rentschler Co.  
National Meter Co.  
Otto Gas Engine Works  
Reeves-Cubberley Engine Co.  
St. Marys Machine Co.  
Sturtevant Co., B. F.
- Engines, Gridiron Valve**  
McIntosh & Seymour Corp.
- Engines, High Speed**  
American Blower Co.  
Ball Engine Co.  
Fitchburg Steam Engine Co.  
Fulton Iron Works  
Griscom-Russell Co.  
McIntosh & Seymour Corp.  
Nordberg Manufacturing Co.  
Reeves-Cubberley Engine Co.  
Skinner Engine Co.  
Sturtevant Co., B. F.  
Troy Engine & Machine Co.
- Engines, Hoisting**  
Brown Hoisting Machinery Co.  
Clyde Iron Works  
Hunt Co., Inc., C. W.  
Morris Machine Works  
Nordberg Manufacturing Co.  
Otto Gas Engine Works
- Engines, Oil**  
De La Vergne Machine Co.  
Falk Co.  
Fulton Iron Works  
McIntosh & Seymour Corp.  
Nordberg Manufacturing Co.  
Otto Gas Engine Works  
St. Marys Machine Co.
- Engines, Poppett Valve, for Super-**  
heated Steam  
Murray Iron Works Co.  
Nordberg Manufacturing Co.
- Engines, Pumping**  
Hooven, Owens, Rentschler Co.  
Morris Machine Works  
Murray Iron Works Co.  
Nordberg Manufacturing Co.  
Otto Gas Engine Works  
Wood & Co., R. D.  
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- Engines, Steam**  
American Blower Co.  
Ball Engine Co.  
Bass Foundry & Machine Co.  
Clyde Iron Works  
Fitchburg Steam Engine Co.  
Fulton Iron Works  
Gas Engine & Power Co., and  
Charles L. Seabury & Co.,  
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Murray Iron Works Co.  
Nordberg Manufacturing Co.  
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ing Co.
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Nordberg Manufacturing Co.

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- Excavating Machinery**  
Clyde Iron Works  
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- Exhaust Fans**  
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- Exhaust Heads**  
Best Manufacturing Co.  
Crane Co.  
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Construction Co.  
Sturtevant Co., B. F.  
Willcox Engineering Co., Inc.
- Exhaust Outlets**  
Marshall Foundry Co.
- Exhausters, Gas**  
American Blower Co.  
Roots Co., P. H. & F. M.  
Sturtevant Co., B. F.
- Expansion Joints**  
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- Extracting Apparatus**  
Devine Co., J. P.
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- Factory Equipment**  
Durand Steel Locker Co.
- Fans, Automobile**  
McCord Manufacturing Co.
- Fans, Electric**  
American Blower Co.  
Sturtevant Co., B. F.
- Fans, Exhaust and Ventilating**  
American Blower Co.  
Sturtevant Co., B. F.
- Feed Water Circulators, Heaters, Regulators, etc.**  
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- Feed Water Heaters and Purifiers**  
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- Felt Goods, Mechanical**  
Booth, N. E.
- Ferrules**  
American Vulcanized Fibre Co.  
Bridgeport Brass Co.  
Diamond State Fibre Co.
- Fibre, Vulcanized**  
American Vulcanized Fibre Co.  
Diamond State Fibre Co.
- Fibre Shipping Case Machinery**  
Knowlton Co., M. D.
- Filters, Oil**  
Koven & Brother, L. O.  
Richardson-Phenix Co.
- Filters, Water**  
Griscom-Russell Co.  
Kennicott Co.  
Koven & Brother, L. O.
- Fire Brick, Hydrants, etc.**  
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- Fittings, Aluminum**  
Aluminum Co. of America
- Fittings, Ammonia**  
Crane Co.  
De La Vergne Machine Co.  
Kelly & Jones Co.  
Lunkenheimer Co.  
Vilter Manufacturing Co.
- Fittings, Flanged**  
American District Steam Co.  
Best Manufacturing Co.  
Crane Co.  
Kelly & Jones Co.  
Lunkenheimer Co.  
Malleable Iron Fittings Co.  
McNab & Harlin Manufacturing Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Simmons Co., John  
Wood & Co., R. D.
- Fittings, Hydraulic**  
Best Manufacturing Co.  
Crane Co.  
McNab & Harlin Manufacturing Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Wood & Co., R. D.
- Fittings, Pipe**  
American District Steam Co.  
Best Manufacturing Co.  
Crane Co.  
Kelly & Jones Co.  
Lunkenheimer Co.  
Malleable Iron Fittings Co.  
McNab & Harlin Manufacturing Co.  
Mark Manufacturing Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Simmons Co., John
- Fittings, Railing**  
Crane Co.  
Kelly & Jones Co.  
Simmons Co., John
- Fittings, Steel**  
Best Manufacturing Co.  
Crane Co.  
Lunkenheimer Co.  
Malleable Iron Fittings Co.  
Mark Manufacturing Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Simmons Co., John
- Flanges**  
American District Steam Co.  
Best Manufacturing Co.  
Crane Co.  
Kelly & Jones Co.  
Lunkenheimer Co.  
Malleable Iron Fittings Co.  
McNab & Harlin Manufacturing Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Simmons Co., John
- Flexible Metal Tubing, Shafting, etc.**  
(See Metal Tubing, Shafting, etc., Flexible)
- Floor Stands**  
Best Manufacturing Co.  
Crane Co.  
Darling Pump & Mfg. Co., Ltd.  
Kennedy Valve Mfg. Co.  
Ludlow Valve Manufacturing Co.  
Lunkenheimer Co.  
Nelson Valve Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Pratt & Cady Co.  
Simmons Co., John

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**Forges**

American Gas Furnace Co.  
Ingersoll-Rand Co.  
Roots Co., F. H. & F. M.  
Sturtevant Co., B. F.

**Forging Machines**

Bliss Co., E. W.  
Williams, White & Co.

**Forgings, Iron**

Bass Foundry & Machine Co.

**Forgings, Monel Metal**

Bayonne Casting Co.

**Forgings, Steel**

Bass Foundry & Machine Co.  
Colonial Steel Co.  
Halcomb Steel Co.

**Forming Machines, Paper and Card-board**

Knowlton Co., M. D.

**Forming Machines, Wire**

New England Butt Co.

**Foundry Equipment**

Mohr & Sons, John

**Friction Clutches**

(See Clutches, Friction)

**Frictions, Fibre**

American Vulcanized Fibre Co.  
Diamond State Fibre Co.

**Frictions, Paper and Iron**

Caldwell & Son Co., H. W.  
Hill Clutch Co.  
Weller Manufacturing Co.

**Fuel Economizers**

(See Economizers, Fuel)

**Fuel Oil Systems**

Hydraulic Oil Storage Co.

**Furnace Equipment, Boiler**

Green Engineering Co.  
Illinois Stoker Co.  
Laclede-Christy Clay Products Co.  
McClave-Brooks Co.  
Marion Machine, Foundry & Supply Co.  
Model Stoker Co.  
Murphy Iron Works  
Rosedale Foundry & Machine Co.  
Washburn & Granger

**Furnace Linings**

(See Linings, Furnace)

**Furnaces, Annealing and Tempering**

American Gas Furnace Co.

**Furnaces, Blast**

Coatesville Boiler Works  
Dover Boiler Works  
Mohr & Sons, John

**Furnaces, Boiler**

Green Engineering Co.  
Illinois Stoker Co.  
Laclede-Christy Clay Products Co.  
Model Stoker Co.  
Murphy Iron Works  
Rosedale Foundry & Machine Co.

**Furnaces, Gas**

American Gas Furnace Co.  
Koven & Brother, L. O.

**Furnaces, Melting**

American Gas Furnace Co.  
Koven & Brother, L. O.

**Furnaces, Muffle**

American Gas Furnace Co.

**Furnaces, Oil**

Ingersoll-Rand Co.

**Furnaces, Smokeless**

Green Engineering Co.

**Illinois Stoker Co.**

Laclede-Christy Clay Products Co.

**Model Stoker Co.**

Murphy Iron Works  
Rosedale Foundry & Machine Co.

**Fuses**

D & W Fuse Co.

**Gage Boards**

American Steam Gauge & Valve Mfg. Co.

**Gage Testers**

American Steam Gauge & Valve Mfg. Co.

**Gages, Ammonia**

American Steam Gauge & Valve Mfg. Co.  
Pratt & Cady Co.

**Gages, Differential Pressure**

American Steam Gauge & Valve Mfg. Co.

**Gages, Draft**

American Steam Gauge & Valve Mfg. Co.  
Tagliabue Mfg. Co., C. J.

**Gages, Hydraulic**

American Steam Gauge & Valve Mfg. Co.  
Lunkenheimer Co.

**Gages, Pressure**

American Steam Gauge & Valve Mfg. Co.  
Goulds Manufacturing Co.  
Lunkenheimer Co.

**Gages, Vacuum**

American Steam Gauge & Valve Mfg. Co.  
Lunkenheimer Co.  
Tagliabue Mfg. Co., C. J.

**Gages, Water**

American Steam Gauge & Valve Mfg. Co.  
Crane Co.  
Detroit Lubricator Co.  
Jenkins Bros.  
Kelly & Jones Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing Co.  
Marion Machine, Foundry & Supply Co.  
Penberthy Injector Co.  
Pratt & Cady Co.  
Simmons Co., John

**Gages, Water Level**

American Steam Gauge & Valve Mfg. Co.

**Galvanizing**

Koven & Brother, L. O.  
Malleable Iron Fittings Co.

**Garage Equipment**

Hydraulic Oil Storage Co.

**Gas Burners, Compressors, Engines, Exhausters, etc.**

(See Burners, Compressors, Engines, Exhausters, etc., Gas)

**Gas Cleaning Plants**

Coal & Coke By-Products Co.  
Wood & Co., R. D.

**Gas Line Materials**

Pittsburgh Valve, Foundry & Construction Co.

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- Gas Plant Machinery**  
 American Gas Furnace Co.  
 Coal & Coke By-Products Co.  
 Wood & Co., R. D.
- Gaskets**  
 American Vulcanized Fibre Co.  
 Booth, N. E.  
 Boston Belting Co.  
 Crane Co.  
 Diamond State Fibre Co.  
 Fibre Finishing Co.  
 Goetze Gasket & Packing Co.  
 Goodrich Co., B. F.  
 Greene, Tweed & Co.  
 Jenkins Bros.  
 La Favorite Rubber Mfg. Co.  
 McCord Manufacturing Co.
- Gasoline Storage Equipments**  
 Hydraulic Oil Storage Co.
- Gates, Blast**  
 American Blower Co.  
 Best Manufacturing Co.  
 Roots Co., P. H. & F. M.  
 Sturtevant Co., B. F.
- Gates, Cut-Off**  
 Hunt Co., Inc., C. W.  
 Link-Belt Co.
- Gates, Sluice**  
 Best Manufacturing Co.  
 Kennedy Valve Mfg. Co.  
 Ludlow Valve Manufacturing Co.  
 Pittsburgh Valve, Foundry & Construction Co.  
 Wood & Co., R. D.
- Gear Cutting Machines**  
 Bilgram Machine Works
- Gear Shapers**  
 Fellows Gear Shaper Co.
- Gears, Cut**  
 Bilgram Machine Works  
 Blount Engineering Co.  
 Brown Co., A. & F.  
 Caldwell & Son Co., H. W.  
 Earle Gear & Machine Co.  
 Falk Co.  
 Fellows Gear Shaper Co.  
 Hill Clutch Co.  
 Plamondon Mfg. Co., A.
- Gears, Fibre**  
 American Vulcanized Fibre Co.  
 Diamond State Fibre Co.
- Gears, Herringbone**  
 Falk Co.  
 Earle Gear & Machine Co.
- Gears, Molded**  
 Brown Co., A. & F.  
 Caldwell & Son Co., H. W.  
 Hill Clutch Co.  
 Plamondon Mfg. Co., A.  
 Weller Manufacturing Co.
- Gears, Steel**  
 Falk Co.
- Gears, Worm**  
 Caldwell & Son Co., H. W.  
 Earle Gear & Machine Co.  
 Weller Manufacturing Co.
- Generating Sets**  
 American Blower Co.  
 Gas Engine & Power Co., and  
 Charles L. Seabury & Co.,  
 Cons.  
 General Electric Co.  
 Sturtevant Co., B. F.
- Generators, Electric**  
 General Electric Co.  
 Sturtevant Co., B. F.
- Generators, Gas**  
 American Gas Furnace Co.
- Generators, Oxy-Acetylene**  
 Oxweld Acetylene Co.
- Glass Finishing Machinery, Plate**  
 Hooven, Owens, Rentschler Co.
- Glass Cutting Wheels**  
 Norton Co.
- Governors, Air Compressor**  
 Hall Steam Pump Co.  
 National Brake & Electric Co.
- Governors, Gas Engine**  
 Pickering Governor Co.
- Governors, Pump**  
 D'Este Co., Julia  
 Dunham Co., C. A.  
 Foster Engineering Co.  
 Richardson-Phenix Co.  
 "S-C" Regulator Co.
- Governors, Steam Engine**  
 Pickering Governor Co.
- Governors, Steam Turbine**  
 Pickering Governor Co.
- Graduating Machines**  
 Modern Tool Co.
- Grates and Grate Bars**  
 Bass Foundry & Machine Co.  
 McClave-Brooks Co.  
 Marion Machine, Foundry & Supply Co.  
 Murray Iron Works Co.  
 Washburn & Granger
- Grates, Dumping**  
 McClave-Brooks Co.  
 Marion Machine, Foundry & Supply Co.  
 Murray Iron Works Co.  
 Washburn & Granger
- Grates, Shaking**  
 Combustion Engineering Corp.  
 McClave-Brooks Co.  
 Marion Machine, Foundry & Supply Co.  
 Murray Iron Works Co.  
 Washburn & Granger
- Grease**  
 Albany Lubricating Co.  
 Texas Co.
- Grease Cups**  
 (See Oil and Grease Cups)
- Grease Extractors**  
 (See Separators, Oil)
- Grinders**  
 Brown Co., A. & F.  
 Williams Patent Crusher & Pulverizer Co.
- Grinders, Chaser**  
 Geometric Tool Co.  
 Landis Machine Co., Inc.  
 Modern Tool Co.
- Grinding Machines, Cylindrical**  
 Landis Tool Co.  
 Modern Tool Co.
- Grinding Machines, Internal**  
 Landis Tool Co.  
 Modern Tool Co.
- Grinding Machines, Plain**  
 Landis Tool Co.  
 Modern Tool Co.
- Grinding Machines, Portable, Pneumatic**  
 Ingersoll-Rand Co.
- Grinding Machines, Tool**  
 Landis Tool Co.  
 Modern Tool Co.
- Grinding Machines, Universal**  
 Landis Tool Co.  
 Modern Tool Co.

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**Grinding or Polishing Machines**

Landis Tool Co.  
Norton Co.

**Grinding Pans**

(See Pans, Grinding)

**Grinding Wheels**

Norton Co.

**Hammers, Drop**

Alliance Machine Co.  
Bliss Co., E. W.  
Williams, White & Co.

**Hammers, Pneumatic**

Ingersoll-Rand Co.

**Hammers, Power**

Williams, White & Co.

**Hammers, Rotary Riveting**

Williams, White & Co.

**Hammers, Steam**

Alliance Machine Co.

**Handles, Machine (Steel)**

Cincinnati Ball Crank Co.

**Handles, Fibre**

American Vulcanized Fibre Co.  
Diamond State Fibre Co.

**Hangers, Shaft**

American Tool & Machine Co.  
Brown Co., A. & F.  
Caldwell & Son Co., H. W.  
Falls Clutch & Machinery Co.  
Hill Clutch Co.  
Plamondon Mfg. Co., A.  
Weller Manufacturing Co.

**Hangers, Shaft, Ball and Roller Bearing**

Hess-Bright Manufacturing Co.  
Hyatt Roller Bearing Co.

**Heading, Upsetting and Forging Machines**

Williams, White & Co.

**Heat Controllers**

(See Controllers, Heat)

**Heaters, Feed Water (Closed)**

Blake & Knowles Steam Pump Works  
Griscom-Russell Co.  
Murray Iron Works Co.  
Wheeler Condenser & Engineering Co.  
Wheeler Manufacturing Co., C. H.

**Heaters and Purifiers, Feed Water**

Bass Foundry & Machine Co.  
Blake & Knowles Steam Pump Works  
Griscom-Russell Co.  
Murray Iron Works Co.  
Webster & Co., Warren  
Wickes Boiler Co.

**Heating Machines**

American Gas Furnace Co.

**Heating and Ventilating Apparatus**

American Blower Co.  
Dunham Co., C. A.  
Smith Co., H. B.  
Sturtevant Co., B. F.  
Webster & Co., Warren

**Heating Systems, Exhaust Steam**

American District Steam Co.

**Heating Systems, Vacuum**

Dunham Co., C. A.  
Webster & Co., Warren

**Herringbone Gears**

(See Gears, Herringbone)

**High Speed Engines**

(See Engines, High Speed)

**Hinges, Brass**

Root Co., C. J.

**Hoisting and Conveying Machinery**

Brown Hoisting Machinery Co.  
Clyde Iron Works  
Hunt Co., Inc., C. W.  
Leschen & Sons Rope Co., A.  
Link-Belt Co.  
Robins Conveying Belt Co.  
Roebbling's Sons Co., John A.  
Shepard Electric Crane & Hoist Co.

**Hoisting Engines**

(See Engines, Hoisting)

**Holsts, Belt**

Clyde Iron Works

**Holsts, Electric**

Alliance Machine Co.  
Brown Hoisting Machinery Co.  
Clyde Iron Works  
Hunt Co., Inc., C. W.  
Link-Belt Co.  
Shepard Electric Crane & Hoist Co.

**Holsts, Gas and Gasoline**

Otto Gas Engine Works

**Holsts, Hand (Chain and Rope)**

Brown Hoisting Machinery Co.  
Clyde Iron Works  
Link-Belt Co.

**Holsts, Pneumatic**

Ingersoll-Rand Co.  
Shepard Electric Crane & Hoist Co.

**Holsts, Skip**

Hunt Co., Inc., C. W.  
Robins Conveying Belt Co.

**Holders, Gas**

Koven & Brother, L. O.  
Wood & Co., R. D.

**Hones**

Norton Co.

**Hoppers**

Dover Boiler Works

**Hose, Air**

American Metal Hose Co.  
Boston Belting Co.  
Goodrich Co., B. F.  
Ingersoll-Rand Co.  
National Brake & Electric Co.  
La Favorite Rubber Mfg. Co.

**Hose, Flexible Metal**

American Metal Hose Co.

**Hose, Linen**

Boston Belting Co.  
Goodrich Co., B. F.  
Rossendale-Reddaway Belting & Hose Co.

**Hose, Metal**

American Brass Co.  
American Metal Hose Co.

**Hose, Oil**

American Metal Hose Co.  
Boston Belting Co.  
Goodrich Co., B. F.  
La Favorite Rubber Mfg. Co.

**Hose, Rubber**

Boston Belting Co.  
Goodrich Co., B. F.  
La Favorite Rubber Mfg. Co.

**Hose, Steam**

American Metal Hose Co.  
Boston Belting Co.  
Goodrich Co., B. F.  
Ingersoll-Rand Co.  
La Favorite Rubber Mfg. Co.

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**Hose, Suction**

American Metal Hose Co.  
Boston Belting Co.  
Goodrich Co., B. F.  
La Favorite Rubber Mfg. Co.

**Hose Attachments (Couplings, Bands, Holders, Clamps, etc.)**

Goodrich Co., B. F.  
Ingersoll-Rand Co.  
La Favorite Rubber Mfg. Co.  
McNab & Harlin Manufacturing Co.  
National Brake & Electric Co.

**Humidifying Apparatus**

(See Air Conditioning Apparatus)

**Hydrants, Fire**

Darling Pump & Mfg. Co., Ltd.  
Kennedy Valve Mfg. Co.  
Ludlow Valve Manufacturing Co.  
Pratt & Cady Co.  
Wood & Co., R. D.

**Hydraulic Jacks, Rams, Turbines, etc.**

(See Jacks, Rams, Turbines, etc., Hydraulic)

**Hydraulic Machinery**

Alliance Machine Co.  
Wood & Co., R. D.

**Hydrometers**

Tagliabue Mfg. Co., C. J.

**Hygrometers**

Tagliabue Mfg. Co., C. J.

**I-Beam Trolleys**

(See Trolleys, I-Beam)

**Ice and Refrigeration Machinery**

De La Vergne Machine Co.  
Vilter Manufacturing Co.

**Ice Tools**

Caldwell & Son Co., H. W.

**Impregnating Apparatus**

Devine Co., J. P.

**Incandescent Lamps**

(See Lamps, Incandescent)

**Indicator Fittings and Supplies**

American Steam Gauge & Valve Mfg. Co.  
Trill Indicator Co.

**Indicator Posts**

Best Manufacturing Co.  
Crane Co.  
Darling Pump & Mfg. Co., Ltd.  
Kennedy Valve Mfg. Co.  
Ludlow Valve Manufacturing Co.  
McNab & Harlin Manufacturing Co.  
Pratt & Cady Co.  
Wood & Co., R. D.

**Indicators, Continuous Card**

Trill Indicator Co.

**Indicators, Engine**

American Steam Gauge & Valve Mfg. Co.  
Trill Indicator Co.

**Indicators, Revolution**

American Steam Gauge & Valve Mfg. Co.  
Veeder Manufacturing Co.

**Indicators, Sight Flow**

Richardson-Phenix Co.

**Indicators, Speed**

American Steam Gauge & Valve Mfg. Co.  
Root Co., C. J.  
Veeder Manufacturing Co.

**Industrial Railways**

(See Railways for Industrial Purposes)

**Injectors**

Lunkenheimer Co.  
Penberthy Injector Co.

**Instruments, Testing**

Norma Co. of America  
Riehlé Bros. Testing Machine Co.

**Insulating Machinery for Wire**

New England Butt Co.

**Insulating Materials (Electric)**

American Vulcanized Fibre Co.  
D & W Fuse Co.  
Diamond State Fibre Co.

**Insulating Materials (Heat and Cold)**

Armstrong Cork & Insulation Co.  
Booth, N. E.  
Diamond State Fibre Co.  
Keasbey Co., Robert A.

**Jacks, Hydraulic**

Joyce-Cridland Co.

**Jacks, Geared**

Joyce-Cridland Co.

**Jacks, Lifting**

Joyce-Cridland Co.

**Jacks, Screw**

Joyce-Cridland Co.  
Riehlé Bros. Testing Machine Co.

**Jacks, Traversing**

Joyce-Cridland Co.

**Jets, Steam**

(See Blowers, Steam Jet)

**Joints, Expansion**

American District Steam Co.  
Best Manufacturing Co.  
Crane Co.  
Griscom-Russell Co.  
Kelley & Jones Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Simmons Co., John  
Webster & Co., Warren  
Wheeler Condenser & Engineering Co.  
Wheeler Manufacturing Co., C. H.

**Joints, Flanged Pipe**

Best Manufacturing Co.  
Crane Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Simmons Co., John

**Joints, Flexible**

Best Manufacturing Co.

**Joints, Rail**

Falk Co.

**Joints, Swing and Swivel**

Best Manufacturing Co.  
Crane Co.  
Lunkenheimer Co.

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- McNab & Harlin Manufacturing Co.**  
**Simmons Co., John**  
**Jolt Ramming Machines**  
 (See Rammers, Foundry)
- Kettles**  
 Koven & Brother, L. O.  
 Milwaukee Boiler Co.  
 Struthers-Wells Co.
- Key Seaters**  
 Morton Manufacturing Co.
- Keyway Cutters**  
 Morton Manufacturing Co.
- Keys, Machine**  
 Morton Manufacturing Co.
- Kilns, Dry (Brick, Lumber, Stone, etc.)**  
 American Blower Co.  
 Sturtevant Co., B. F.
- Knives, Machine**  
 American Tool & Machine Co.  
 Knowlton Co., M. D.
- Ladles**  
 Marshall Foundry Co.  
 Mohr & Sons, John
- Lamps, Acetylene**  
 Simmons Co., John
- Lamps, Incandescent and Arc**  
 General Electric Co.
- Land-Clearing Machinery**  
 Clyde Iron Works
- Lathe Attachments**  
 American Tool & Machine Co.  
 Bardons & Oliver
- Lathes**  
 American Tool & Machine Co.  
 Bardons & Oliver  
 Jones & Lamson Machine Co.  
 Reed-Prentice Co.  
 Warner & Swasey Co.  
 Windsor Machine Co.
- Lathes, Automatic**  
 Jones & Lamson Machine Co.
- Lathes, Brass**  
 American Tool & Machine Co.  
 Warner & Swasey Co.
- Lathes, Chucking**  
 Jones & Lamson Machine Co.
- Lathes, Foot Power**  
 Reed-Prentice Co.
- Lathes, Speed**  
 Reed-Prentice Co.
- Lathes, Turret**  
 American Tool & Machine Co.  
 Bardons & Oliver  
 Jones & Lamson Machine Co.  
 Reed-Prentice Co.  
 Warner & Swasey Co.  
 Windsor Machine Co.
- Leather Belting, Packing, etc.**  
 (See Belting, Packing, etc., Leather)
- Leathers, Automobile**  
 Jewell Belting Co.
- Lightning-Arresters**  
 General Electric Co.
- Linings, Furnace**  
 Betson Plastic Fire Brick Co.
- Linings, Hollow Stack**  
 Laclede-Christy Clay Products Co.
- Lockers, Steel**  
 Durand Steel Locker Co.
- Locomotives, Compressed Air**  
 Ingersoll-Rand Co.  
 Vulcan Iron Works
- Locomotives, Electric**  
 Brown Hoisting Machinery Co.  
 Hunt Co., Inc., C. W.  
 Robins Conveying Belt Co.
- Logging Machinery**  
 Clyde Iron Works  
 Marion Steam Shovel Co.
- Lubricants**  
 Albany Lubricating Co.  
 Lumen Bearing Co.  
 Texas Co.
- Lubricating Pads, Felt**  
 Booth, N. E.
- Lubricators**  
 Albany Lubricating Co.  
 Crane Co.  
 Lunkenheimer Co.
- Lubricators, Force-Feed, Sight-Feed**  
 Detroit Lubricator Co.  
 Greene, Tweed & Co.  
 Lunkenheimer Co.  
 McCord Manufacturing Co.  
 Madison-Kipp Lubricator Co.  
 Pickering Governor Co.  
 Richardson-Phenix Co.
- Lubricators, Hydrostatic, Sight-Feed**  
 Detroit Lubricator Co.  
 Lunkenheimer Co.  
 Penberthy Injector Co.
- Machine Handles**  
 (See Handles, Machine)
- Machinery**  
 is classified under the headings descriptive of character thereof
- Machinists and Engineers**  
 American Tool & Machine Co.  
 Bilgram Machine Works  
 Blount Engineering Co.  
 Brown Co., A. & F.  
 Caldwell & Son Co., H. W.  
 D'Olier Centrifugal Pump & Machine Co.  
 Earle Gear & Machine Co.  
 Hill Clutch Co.  
 Pittsburgh Valve, Foundry & Construction Co.  
 Rosedale Foundry & Machine Co.  
 Weller Manufacturing Co.  
 Wood & Co., R. D.
- Measures, Registering**  
 (See Meters)
- Measuring and Mixing Machines**  
 Conveying Weigher Co.
- Mechanical Draft Apparatus**  
 American Blower Co.  
 Sturtevant Co., B. F.
- Mechanical Stokers**  
 (See Stokers)
- Metal Bearings, Hose, Packing, etc.**  
 (See Bearings, Hose, Packing, etc., Metal)

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**Metal Work, Plate**

Bass Foundry & Machine Co.  
 Bigelow Co.  
 Coatesville Boiler Works  
 Dillon Steam Boiler Works, D. M.  
 Dover Boiler Works  
 Keeler Co.  
 Kennicott Co.  
 Koven & Brother, L. O.  
 Milwaukee Boiler Co.  
 Mohr & Sons, John  
 Murray Iron Works Co.  
 Struthers-Wells Co.  
 West Pulverizing Machine Co.  
 Willcox Engineering Co., Inc.  
 Wood & Co., R. D.

**Metal Work, Sheet**

Bridgeport Brass Co.  
 Weller Manufacturing Co.  
 Willcox Engineering Co., Inc.

**Metal Work, Stamped**

Bridgeport Brass Co.  
 Root Co., C. J.  
 Willcox Engineering Co., Inc.

**Metallurgical Equipment**

Dorr Cyanide Machinery Co.

**Metals, Anti-Friction**

Allan & Son, A.  
 Lumen Bearing Co.  
 Riverside Metal Refining Co.

**Metals, Bearing**

Allan & Son, A.  
 American Brass Co.  
 Lumen Bearing Co.  
 Riverside Metal Refining Co.

**Metals, Extruded**

Aluminum Co. of America  
 American Brass Co.

**Metals, Gear**

Lumen Bearing Co.  
 Malleable Iron Fittings Co.

**Metals, White**

American Brass Co.  
 Riverside Metal Refining Co.

**Meters, Air, Steam and Gas**

American District Steam Co.  
 General Electric Co.

**Meters, Electric**

General Electric Co.

**Meters, Gasoline and Oil**

Hydraulic Oil Storage Co.  
 Worthington, Henry R.

**Meters, Venturi**

National Meter Co.

**Meters, Water**

National Meter Co.  
 Willcox Engineering Co., Inc.  
 Worthington, Henry R.

**Milling Machines, Plain**

American Tool & Machine Co.  
 Warner & Swasey Co.

**Milling Tools, Adjustable**

Geometric Tool Co.  
 Modern Tool Co.

**Mills and Crushers, Cane**

Fulton Iron Works

**Mixers, Clay, Fertilizer, Chick Food,**

*etc.*  
 Williams Patent Crusher & Pulverizer Co.

**Mixers, Concrete**

Conveying Welgher Co.  
 Knickerbocker Co.

**Mixers, Sand**

Standard Sand & Machine Co.

**Mixers, Wet**

Dorr Cyanide Machinery Co.

**Molds, Ingot**

Marshall Foundry Co.

**Monel Metal**

Bayonne Casting Co.  
 Ruggles-Coles Engineering Co.

**Motors, Compressed Air**

Ingersoll-Rand Co.

**Motors, Electric**

General Electric Co.  
 National Brake & Electric Co.  
 Shepard Electric Crane & Hoist Co.  
 Sturtevant Co., B. F.

**Motor Generators**

General Electric Co.

**Nozzles, Sand and Air**

Ingersoll-Rand Co.  
 Lunkenheimer Co.  
 National Brake & Electric Co.

**Nuts**

Russell, Burdsall & Ward Bolt and Nut Co.

**Odometers**

Veeder Manufacturing Co.

**Oil and Grease Cups**

Albany Lubricating Co.  
 Crane Co.  
 Detroit Lubricator Co.  
 Lunkenheimer Co.  
 Penberthy Injector Co.

**Oil Burners, Engines, Filters, Pumps, etc.**

(See Burners, Engines, Filters, Pumps, etc., Oil)

**Oil Rings, Felt**

Booth, N. E.

**Oil Separating Machines, Centrifugal**

American Tool & Machine Co.  
 D'Olier Centrifugal Pump & Machine Co.

**Oil Storage Systems**

Hydraulic Oil Storage Co.

**Oil Tanks**

Hydraulic Oil Storage Co.  
 Lunkenheimer Co.  
 Richardson-Phenix Co.

**Oil Testing Instruments**

Tagliabue Mfg. Co., C. J.

**Oil Testing Machines**

Riehle Bros. Testing Machine Co.

**Oil Well Machinery**

Marion Machine, Foundry & Supply Co.

**Oiling and Filtering Systems**

Peterson Engineering Co.  
 Richardson-Phenix Co.

**Oiling Devices**

Lunkenheimer Co.  
 Richardson-Phenix Co.

**Oiling Systems**

Lunkenheimer Co.  
 Richardson-Phenix Co.

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**Oils**

Albany Lubricating Co.  
Texas Co.

**Openers, Sash and Window**

Drouvé Co., G.

**Openers, Skylight Window**

Drouvé Co., G.

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France Packing Co.  
Goetze Gasket & Packing Co.  
Goodrich Co., B. F.  
Greene, Tweed & Co.  
Keasbey Co., Robert A.  
La Favorite Rubber Mfg. Co.  
Martell Packings Co.

**Packing, Metallic**

Allan & Son, A.  
France Packing Co.  
Goetze Gasket & Packing Co.  
Keasbey Co., Robert A.  
Martell Packings Co.

**Packing, Rod (Piston and Valve)**

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Boston Belting Co.  
Fibre Finishing Co.  
France Packing Co.  
Goetze Gasket & Packing Co.  
Goodrich Co., B. F.  
Greene, Tweed & Co.  
Jenkins Bros.  
Keasbey Co., Robert A.  
La Favorite Rubber Mfg. Co.  
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Goodrich Co., B. F.  
Jenkins Bros.  
Keasbey Co., Robert A.  
La Favorite Rubber Mfg. Co.

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Diamond State Fibre Co.  
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Jenkins Bros.  
Keasbey Co., Robert A.  
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Wood & Co., R. D.

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Crane Co.  
Dover Boiler Works  
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Koven & Brother, L. O.  
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Crane Co.  
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Simmons Co., John

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Dillon Steam Boiler Works, D. M.  
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Keeler Co., E.  
Kennicott Co.  
Koven & Brother, L. O.  
Milwaukee Boiler Co.  
Mohr & Sons, John  
Murray Iron Works Co.  
Struthers-Wells Co.
- Stamps and Dies, Steel**  
Bliss Co., E. W.
- Stampings, Sheet Metal**  
Root Co., C. J.  
Willcox Engineering Co., Inc.
- Standpipes**  
Bass Foundry & Machine Co.  
Coatesville Boiler Works  
Dover Boiler Works  
Kennicott Co.
- Steam Engines, Separators, Shovels, Traps, etc.**  
(See Engines, Separators, Shovels, Traps, etc., Steam)
- Steam Heating Circulators**  
(See Circulators, Steam Heating)
- Steam Specialties**  
American Blower Co.  
American District Steam Co.  
American Steam Gauge & Valve Mfg. Co.

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- Best Manufacturing Co.  
Crane Co.  
D'Este Co., Julian  
Foster Engineering Co.  
Griscom-Russell Co.  
Lunkenheimer Co.  
Morehead Manufacturing Co.  
Penberthy Injector Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Webster & Co., Warren
- Steel, Alloy**  
Halcomb Steel Co.
- Steel, Bright Finished**  
Union Drawn Steel Co.
- Steel, Cold Drawn**  
Colonial Steel Co.  
Union Drawn Steel Co.  
Halcomb Steel Co.
- Steel, Cold Rolled**  
Halcomb Steel Co.  
Union Drawn Steel Co.  
Ward's Sons, Edgar T.
- Steel, Electric**  
Halcomb Steel Co.
- Steel, High Speed**  
Colonial Steel Co.  
Halcomb Steel Co.  
Ward's Sons, Edgar T.
- Steel, Nickel**  
Colonial Steel Co.  
Halcomb Steel Co.  
Union Drawn Steel Co.
- Steel, Open Hearth**  
Colonial Steel Co.  
Union Drawn Steel Co.
- Steel, Spring**  
Colonial Steel Co.
- Steel, Strip**  
Ward's Sons, Edgar T.
- Steel, Tool**  
Colonial Steel Co.  
Halcomb Steel Co.  
Ward's Sons, Edgar T.
- Steel, Vanadium**  
Colonial Steel Co.  
Halcomb Steel Co.  
Union Drawn Steel Co.
- Steel Lockers, Racks, etc.**  
(See Lockers, Racks, etc., Steel)
- Steel Plate Construction**  
Bass Foundry & Machine Co.  
Bigelow Co.  
Coatesville Boiler Works  
Dillon Steam Boiler Works, D.  
M.  
Dover Boiler Works  
Keeler Co., E.  
Kennicott Co.  
Koven & Brother, L. O.  
Milwaukee Boiler Co.  
Mohr & Sons, John  
Murray Iron Works Co.  
Struthers-Wells Co.  
West Pulverizing Machine Co.  
Wood & Co., R. D.
- Steel Strips, Tempered and Blued**  
Ward's Sons, Edgar T.
- Sterilizers**  
Koven & Brother, L. O.  
Mohr & Sons, John
- Stillls**  
Milwaukee Boiler Co.  
Struthers-Wells Co.
- Stocks and Dies**  
Borden Co.  
Crane Co.
- Mark Manufacturing Co.  
Simmons Co., John
- Stokers**  
Green Engineering Co.  
Illinois Stoker Co.  
Laclede-Christy Clay Products  
Co.  
McClave-Brooks Co.  
Model Stoker Co.  
Murphy Iron Works  
Rosedale Foundry & Machine Co.
- Stokers, Chain Grate**  
Green Engineering Co.  
Illinois Stoker Co.  
Laclede-Christy Clay Products  
Co.  
Rosedale Foundry & Machine Co.
- Stokers, Inclined Grate**  
McClave-Brooks Co.  
Model Stoker Co.  
Murphy Iron Works
- Stoves, Drying**  
Drouvé Co., G.
- Stoves, Hot Blast**  
Mohr & Sons, John
- Strainers, Water**  
Pittsburgh Valve, Foundry &  
Construction Co.
- Structural Steel Work**  
Dover Boiler Works
- Sugar Machinery**  
Hooven, Owens, Rentschler Co.  
Wood & Co., R. D.
- Switches, Electric**  
General Electric Co.  
National Brake & Electric Co.
- Switches and Frogs, Railroad**  
Falk Co.
- Switchboards**  
General Electric Co.
- Synchronous Converters**  
(See Converters, Synchronous)
- Tachometers**  
Veeder Manufacturing Co.
- Tackle Blocks**  
(See Blocks, Tackle)
- Tank Work (Air, Gas, Oil and  
Water)**  
Bass Foundry & Machine Co.  
Bigelow Co.  
Coatesville Boiler Works  
Dillon Steam Boiler Works, D.  
M.  
Dover Boiler Works  
Keeler Co., E.  
Kennicott Co.  
Koven & Brother, L. O.  
Milwaukee Boiler Co.  
Mohr & Sons, John  
Murray Iron Works Co.  
Struthers-Wells Co.  
Wood & Co. R. D.
- Tanks, Aluminum**  
Aluminum Co. of America
- Tanks, Car**  
Kennicott Co.
- Tanks, Copper**  
Koven & Brother, L. O.
- Tanks, Sedimentation**  
Dorr Cyanide Machinery Co.

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- Tanks, Storage**  
Coatesville Boiler Works  
Dover Boiler Works  
Hydraulic Oil Storage Co.  
Kennicott Co.  
Milwaukee Boiler Co.  
Struthers-Wells Co.  
Willcox Engineering Co., Inc.
- Tanks, Welded**  
Devine Co., J. P.  
Mohr & Sons, John  
Struthers-Wells Co.
- Tapping Attachments**  
Geometric Tool Co.  
Modern Tool Co.  
Peter Bros. Manufacturing Co.
- Tapping Machines**  
Geometric Tool Co.  
Modern Tool Co.  
Peter Bros. Manufacturing Co.
- Tapping Machines, Multiple Head**  
Williams, White & Co.
- Tapping Machines, Water**  
Simmons Co., John
- Taps, Collapsing**  
Geometric Tool Co.  
Ideal Tool & Manufacturing Co.
- Taps and Dies**  
Geometric Tool Co.  
Modern Tool Co.
- Telphers**  
(See Tramrail Systems, Overhead)
- Temperature Regulators**  
(See Regulators, Temperature)
- Testing Machines**  
Riehle Bros. Testing Machine Co.
- Thermometers**  
American Steam Gauge & Valve Mfg. Co.  
Tagliabue Mfg. Co., C. J.
- Thickeners**  
Dorr Cyanide Machinery Co.
- Thread Cutting Tools**  
Borden Co.  
Crane Co.  
Geometric Tool Co.  
Ideal Tool & Manufacturing Co.  
Jones & Lamson Machine Co.  
Landis Machine Co., Inc.  
Mark Manufacturing Co.  
Modern Tool Co.  
Simmons Co., John
- Time Recorders**  
Willcox Engineering Co., Inc.
- Tinware Machinery**  
Bliss Co., E. W.
- Tools, Brass-Working Machine**  
Warner & Swasey Co.
- Tools, Lathe**  
Bardons & Oliver
- Track, Industrial**  
Hunt Co., Inc., C. W.
- Track Work, Special**  
Falk Co.
- Tramrail Systems, Overhead**  
Brown Hoisting Machinery Co.  
Link-Belt Co.  
Shepard Electric Crane & Hoist Co.
- Tramways, Bridge**  
Brown Hoisting Machinery Co.  
Hunt Co., Inc., C. W.  
Link-Belt Co.  
Robins Conveying Belt Co.
- Tramways, Loop-Line**  
Consolidated Tramway Co.
- Tramways, Wire Rope**  
Clyde Iron Works  
Consolidated Tramway Co.  
Leschen & Sons Rope Co., A.  
Roebbling's Sons Co., John A.
- Transformers, Electric**  
General Electric Co.
- Transmission Machinery**  
(See Power Transmission Machinery)
- Traps, Condenser**  
Morehead Manufacturing Co.
- Traps, Radiator**  
Dunham Co., C. A.
- Traps, Return**  
American Blower Co.  
Crane Co.  
D'Este Co., Julian  
Morehead Manufacturing Co.  
Webster & Co., Warren
- Traps Steam**  
American Blower Co.  
American District Steam Co.  
American Steam Gauge & Valve Mfg. Co.  
Crane Co.  
D'Este Co., Julian  
Dunham Co., C. R.  
Jenkins Bros.  
Kelly & Jones Co.  
Morehead Manufacturing Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Pratt & Cady Co.  
Sturtevant Co., B. F.  
Webster & Co., Warren
- Traps, Vacuum**  
American Blower Co.  
Crane Co.  
Dunham Co., C. A.  
Morehead Manufacturing Co.  
Webster & Co., Warren
- Treating Machines, Paper and Card-board**  
Knowlton Co., M. D.
- Trolleys, I-Beam**  
Brown Hoisting Machinery Co.  
Link-Belt Co.  
Shepard Electric Crane & Hoist Co.
- Trolley Wheels**  
(See Wheels, Trolley)
- Trucks, Electric**  
Hunt Co., Inc., C. W.
- Trucks, Mill**  
American Vulcanized Fibre Co.  
Diamond State Fibre Co.
- Tube Cutters**  
(See Cutters, Pipe and Tube)
- Tube Mills**  
West Pulverizing Machine Co.
- Tube Rolling Machines, for Paper**  
Knowlton Co., M. D.
- Tubes, Boiler**  
Mark Manufacturing Co.
- Tubes, Condenser**  
Aluminum Co. of America  
Bridgeport Brass Co.
- Tubes, Pneumatic Despatch**  
Lamson Co.
- Tubing, Aluminum**  
Aluminum Co. of America
- Tubing, Fibre**  
American Vulcanized Fibre Co.  
Diamond State Fibre Co.

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- Tubing, Flexible Metal**  
American Metal Hose Co.
- Tubing, Iron and Steel**  
Kelly & Jones Co.
- Tubing, Rubber**  
Boston Belting Co.  
Goodrich Co., B. F.  
Lunkenheimer Co.
- Tubing, Seamless, Brass and Copper**  
American Brass Co.  
Best Manufacturing Co.  
Bridgeport Brass Co.  
Crane Co.
- Tubing, Seamless, Cold Drawn**  
American Brass Co.  
Best Manufacturing Co.  
Bridgeport Brass Co.
- Tubing, Seamless, Steel**  
Best Manufacturing Co.  
Ward's Sons, Edgar T.
- Tumbling Barrels**  
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- Turbines, Hydraulic**  
Morris Co., I. F.
- Turbines, Steam**  
General Electric Co.  
Sturtevant Co., B. F.
- Turbo-Generators**  
General Electric Co.  
Sturtevant Co., B. F.
- Turnbuckles**  
Russell, Burdsall & Ward Bolt and Nut Co.
- Turntables**  
Hunt Co., Inc., C. W.
- Turret Machines**  
American Tool & Machine Co.  
Bardons & Oliver  
Jones & Lamson Machine Co.  
Reed-Prentice Co.  
Warner & Swasey Co.  
Windsor Machine Co.
- Uniflow Engines**  
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- Unions**  
Best Manufacturing Co.  
Crane Co.  
Kelly & Jones Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing Co.  
Mark Manufacturing Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Simmons Co., John
- Unloaders, Ballast**  
Marion Steam Shovel Co.
- Upsetting Machines**  
Williams, White & Co.
- Vacuum Drying Apparatus**  
(See Dryers, Vacuum)
- Vacuum Heating Systems**  
(See Heating Systems, Vacuum)
- Vacuum Pans, Pumps, Traps, etc.**  
(See Pans, Pumps, Traps, etc., Vacuum)
- Valve Balls**  
Auburn Ball Bearing Co.  
Boston Belting Co.  
Goodrich Co., B. F.  
Lunkenheimer Co.
- Valve Boxes**  
Darling Pump & Mfg. Co., Ltd.  
Kennedy Valve Mfg. Co.  
Ludlow Valve Manufacturing Co.  
Pratt & Cady Co.  
Wood & Co., R. D.
- Valve Discs**  
Allan & Son, A.  
American Vulcanized Fibre Co.  
Boston Belting Co.  
Diamond State Fibre Co.  
Goetze Gasket & Packing Co.  
Goodrich Co., B. F.  
Jenkins Bros.  
La Favorite Rubber Mfg. Co.
- Valves, Air Automatic**  
Dunham Co., C. A.  
Jenkins Bros.  
Simmons Co., John  
Smith Co., H. B.
- Valves, Air Operating**  
National Brake & Electric Co.
- Valves, Air Relief**  
Crane Co.  
Ludlow Valve Manufacturing Co.  
McNab & Harlin Manufacturing Co.
- Valves, Ammonia**  
Crane Co.  
De La Vergne Machine Co.  
Jenkins Bros.  
Kelly & Jones Co.  
Ludlow Valve Manufacturing Co.  
Lunkenheimer Co.  
Pratt & Cady Co.  
Simmons Co., John  
Vilter Manufacturing Co.
- Valves, Angle Gate**  
Lunkenheimer Co.  
Pratt & Cady Co.  
Wood & Co., R. D.
- Valves, Automatic Cut-Off**  
(See Valves, Non-Return)
- Valves, Back Pressure**  
American District Steam Co.  
Best Manufacturing Co.  
Crane Co.  
Foster Engineering Co.  
Jenkins Bros.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Pratt & Cady Co.
- Valves, Balanced**  
Crane Co.  
Foster Engineering Co.  
Homestead Valve Manufacturing Co.  
Ludlow Valve Manufacturing Co.  
Willcox Engineering Co., Inc.
- Valves, Balanced Distribution**  
American Balanced Valve Co.
- Valves, Blowoff**  
Best Manufacturing Co.  
Crane Co.  
Homestead Valve Manufacturing Co.  
Jenkins Bros.  
Kelly & Jones Co.  
Ludlow Valve Manufacturing Co.

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- Lunkenheimer Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Pratt & Cady Co.  
Simmons Co., John
- Valves, Butterfly**  
Best Manufacturing Co.  
Crane Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing  
Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Simmons Co., John
- Valves, By-Pass**  
Best Manufacturing Co.  
Crane Co.  
Jenkins Bros.  
Kennedy Valve Mfg. Co.  
Ludlow Valve Manufacturing Co.  
Lunkenheimer Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Simmons Co., John
- Valves, Check**  
Best Manufacturing Co.  
Crane Co.  
Darling Pump & Mfg. Co., Ltd.  
Jenkins Bros.  
Kelly & Jones Co.  
Kennedy Valve Mfg. Co.  
Ludlow Valve Manufacturing Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing  
Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Pratt & Cady Co.  
Simmons Co., John  
Wood & Co., R. D.  
Worthington, Henry R.
- Valves, Exhaust Relief**  
Best Manufacturing Co.  
Crane Co.  
Foster Engineering Co.  
Jenkins Bros.  
Lunkenheimer Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Pratt & Cady Co.  
Wheeler Condenser & Engineer-  
ing Co.  
Wheeler Manufacturing Co., C. H.
- Valves, Float**  
Best Manufacturing Co.  
Crane Co.  
Foster Engineering Co.  
Homestead Valve Manufacturing  
Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Simmons Co., John  
Willcox Engineering Co., Inc.
- Valves, Foot**  
Best Manufacturing Co.  
Crane Co.  
Kelly & Jones Co.  
Ludlow Valve Manufacturing Co.  
McNab & Harlin Manufacturing  
Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Simmons Co., John  
Wood & Co., R. D.  
Worthington, Henry R.
- Valves, Gate**  
American District Steam Co.  
Best Manufacturing Co.  
Crane Co.  
Darling Pump & Mfg. Co., Ltd.  
Jenkins Bros.  
Kelly & Jones Co.  
Kennedy Valve Mfg. Co.
- Ludlow Valve Manufacturing Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing  
Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Pratt & Cady Co.  
Simmons Co., John  
Wood & Co., R. D.
- Valves, Globe, Angle and Cross**  
American District Steam Co.  
Best Manufacturing Co.  
Crane Co.  
Jenkins Bros.  
Kelly & Jones Co.  
Kennedy Valve Mfg. Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing  
Co.  
Penberthy Injector Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Pratt & Cady Co.  
Simmons Co., John
- Valves, Hose**  
Crane Co.  
Jenkins Bros.  
Kennedy Valve Mfg. Co.  
Ludlow Valve Manufacturing Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing  
Co.  
Pratt & Cady Co.
- Valves, Hydraulic**  
Best Manufacturing Co.  
Crane Co.  
Ludlow Valve Manufacturing Co.  
McNab & Harlin Manufacturing  
Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Wood & Co., R. D.
- Valves, Hydraulic Operating**  
Best Manufacturing Co.  
Pittsburgh Valve, Foundry &  
Construction Co.  
Wood & Co., R. D.
- Valves, Piston**  
American Balance Valve Co.
- Valves, Non-Return**  
Crane Co.  
Foster Engineering Co.  
Jenkins Bros.  
Lunkenheimer Co.  
Pittsburgh Valve, Foundry &  
Construction Co.
- Valves, Plug**  
Homestead Valve Manufacturing  
Co.  
Pittsburgh Valve, Foundry &  
Construction Co.
- Valves, Pop Safety**  
American Steam Gauge & Valve  
Mfg. Co.  
Crane Co.  
Detroit Lubricator Co.  
Lunkenheimer Co.  
National Brake & Electric Co.  
Simmons Co., John
- Valves, Pump**  
American Vulcanized Fibre Co.  
Boston Belting Co.  
Diamond State Fibre Co.  
Goodrich Co., B. F.  
Goulds Manufacturing Co.  
Jenkins Bros.  
La Favorite Rubber Mfg. Co.  
Mark Manufacturing Co.  
Wood & Co., R. D.
- Valves, Radiator**  
American District Steam Co.  
Crane Co.

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- Detroit Lubricator Co.  
Jenkins Bros.  
Kelly & Jones Co.  
Kennedy Valve Mfg. Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing Co.  
Pratt & Cady Co.  
Simmons Co., John
- Valves, Reducing**  
American District Steam Co.  
D'Este Co., Julian  
Dunham Co., C. A.  
Foster Engineering Co.  
National Brake & Electric Co.
- Valves, Regulating**  
Crane Co.  
D'Este Co., Julian  
Foster Engineering Co.  
Lunkenheimer Co.  
Simmons Co., John
- Valves, Relief (Water)**  
American Steam Gauge & Valve Mfg. Co.  
Crane Co.  
D'Este Co., Julian  
Foster Engineering Co.  
Ludlow Valve Manufacturing Co.  
Lunkenheimer Co.  
Simmons Co., John  
Wood & Co., R. D.
- Valves, Rubber**  
Boston Belting Co.
- Valves, Safety**  
American Steam Gauge & Valve Mfg. Co.  
Crane Co.  
Detroit Lubricator Co.  
Jenkins Bros.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing Co.  
National Brake & Electric Co.  
Pratt & Cady Co.  
Simmons Co., John
- Valves, Slide**  
American Balance Valve Co.
- Valves, Steel (Superheated Steam)**  
Best Manufacturing Co.  
Crane Co.  
Foster Engineering Co.  
Jenkins Bros.  
Ludlow Valve Manufacturing Co.  
Lunkenheimer Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Pratt & Cady Co.  
Simmons Co., John
- Valves, Stop and Check**  
Crane Co.  
Foster Engineering Co.  
Jenkins Bros.  
Lunkenheimer Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Pratt & Cady Co.
- Valves, Throttle**  
Best Manufacturing Co.  
Crane Co.  
Detroit Lubricator Co.  
Jenkins Bros.  
Kennedy Valve Mfg. Co.  
Ludlow Valve Manufacturing Co.  
Lunkenheimer Co.  
McNab & Harlin Manufacturing Co.  
Pittsburgh Valve, Foundry & Construction Co.  
Pratt & Cady Co.  
Simmons Co., John
- Variable Speed Transmissions**  
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- Ventilating and Heating Apparatus**  
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- Vises, Pipe**  
Mark Manufacturing Co.
- Vulcanizers**  
Bigelow Co.  
Dillon Steam Boiler Works, D. M.
- Washers, Felt**  
Booth, N. E.
- Washers, Fibre**  
American Vulcanized Fibre Co.  
Diamond State Fibre Co.
- Washers, Rubber**  
Boston Belting Co.  
Goodrich Co., B. F.  
La Favorite Rubber Mfg. Co.
- Washers, Steel**  
Auburn Ball Bearing Co.
- Washing Machines**  
(See Classifiers)
- Waste Washing Centrifugals**  
(See Centrifugals, Oil and Waste)
- Water Circulators, Filters, Gages, Heaters, Meters, etc.**  
(See Circulators, Filters, Gages, Heaters, Meters, etc., Water)
- Water Columns**  
American Steam Gauge & Valve Mfg. Co.  
Lunkenheimer Co.
- Water Purifying Plants**  
(See Purifying and Softening Systems, Water)
- Water Softening Apparatus**  
Kennicott Co.
- Water Supply Systems, Pneumatic**  
Chicago Pump Co.  
Deming Co.
- Water Tanks and Towers**  
(See Standpipes)
- Water Tube Boilers**  
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- Water Wheels**  
Morris Co., I. P.
- Weighing Machinery, Automatic**  
Automatic Weighing Machine Co.  
Conveying Weigher Co.  
Richardson Scale Co.  
Willcox Engineering Co., Inc.
- Weighers, Coal**  
Brown Holsting Machinery Co.  
Richardson Scale Co.
- Weighers, Conveying**  
Conveying Weigher Co.
- Weighers, Water**  
Richardson Scale Co.  
Willcox Engineering Co., Inc.  
Worthington, Henry R.
- Welding and Cutting Apparatus, Oxy-Acetylene**  
Oxweld Acetylene Co.
- Welding, Oxy-Acetylene**  
Best Manufacturing Co.  
Coatesville Boiler Works  
Oxweld Acetylene Co.

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- Pittsburgh Valve, Foundry &  
Construction Co.  
Struthers-Wells Co.
- Welding Plants**  
Oxweld Acetylene Co.
- Well Supplies and Tools (Points,  
Cylinders, Valves, Well Tools,  
etc.)**  
Mark Manufacturing Co.
- Wheels, Buffing and Polishing**  
Booth, N. E.
- Wheels, Car**  
Bass Foundry & Machine Co.  
Link-Belt Co.
- Wheels, Trolley**  
Lumen Bearing Co.
- Whistles, Steam**  
American Steam Gauge & Valve  
Mfg. Co.  
Brown Co., A. & F.  
Crane Co.  
Lunkenheimer Co.  
Simmons Co., John
- White Metals**  
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- Window Opening Devices**  
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- Wire, Aluminum**  
Aluminum Co. of America
- Wire, Brass and Copper**  
American Brass Co.  
Bridgeport Brass Co.  
Roebbling's Sons Co., John A.
- Wire, Flat**  
Roebbling's Sons Co., John A.
- Wire, Iron and Steel**  
Roebbling's Sons Co., John A.  
Ward's Sons, Edgar T.
- Wire, Monel Metal**  
Bayonne Casting Co.  
Ruggles-Coles Engineering Co.
- Wire and Cables, Electrical**  
Aluminum Co. of America  
American Brass Co.  
Bridgeport Brass Co.  
D & W Fuse Co.  
General Electric Co.  
Roebbling's Sons Co., John A.
- Wire Cloth**  
Caldwell & Son Co., H. W.  
Roebbling's Sons Co., John A.  
Weller Manufacturing Co.
- Wire Forming Machinery**  
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- Wire Insulating Machinery**  
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Wire)
- Wire Rope**  
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- Wire Rope Fastenings**  
Leschen & Sons Rope Co., A.  
Roebbling's Sons Co., John A.
- Wire Specialties**  
Roebbling's Sons Co., John A.
- Wire Testing Machines**  
Riehle Bros. Testing Machine Co.
- Wiring Devices**  
General Electric Co.
- Wrenches**  
Greene, Tweed & Co.  
Roebbling's Sons Co., John A.

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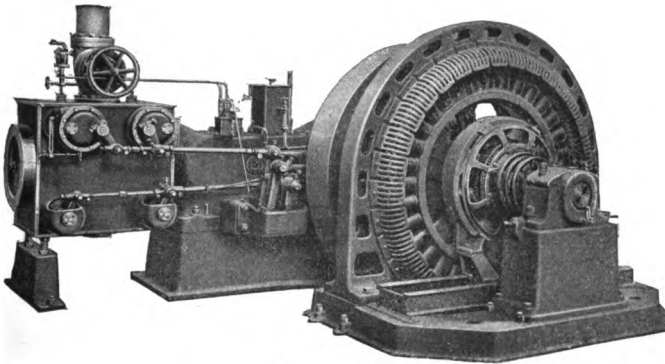
## BALL ENGINE CO.

ERIE, PENNSYLVANIA

**CORLISS-VALVE AND SINGLE-VALVE ENGINES; HORIZONTAL AND VERTICAL SIDE-CRANK ENGINES; TANDEM AND CROSS-COMPOUND SINGLE-VALVE ENGINES, CORLISS-VALVE COMPOUND AND SINGLE-CYLINDER ENGINES.**

### HIGH-SPEED CORLISS ENGINES

The feature which distinguishes this engine from other four-valve shaft governed engines is the patented non-detaching valve gear, which imparts the same movement to the valves that the drop cut-off of the slow-speed Corliss produces by picking up and dropping them. This permits the use of the best form of valve, and the valves are given the movement necessary for the greatest durability and tightness.



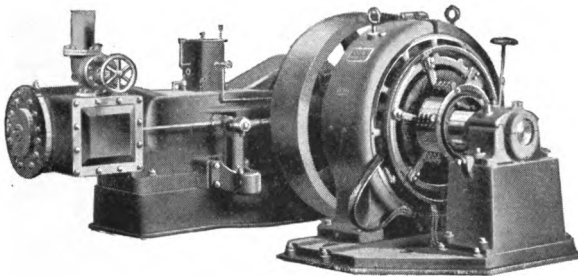
**Horizontal Single Cylinder Side Crank Engine—Corliss Type**

Built in sizes from 100 h.p. to 1200 h.p. in the single-cylinder and cross-compound types.

These engines excel in economy and regulation and are especially adapted for electric service.

### SINGLE-VALVE AUTOMATIC ENGINES

These engines are the result of a long experience in building engines for electric service. They are superior in design and construction. The regulation and economy are the best of their type.



**Single Cylinder Side Crank Engine—Single Valve Type**

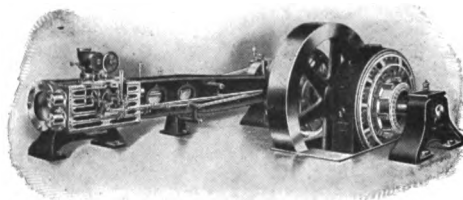
Built in sizes from 25 h.p. to 800 h.p. in the single-cylinder, tandem-compound and cross-compound types.

## THE FITCHBURG STEAM ENGINE CO.

FITCHBURG, MASS.

MANUFACTURERS OF STEAM ENGINES FOR USE UNDER EVERY  
SORT OF CONDITION.

### "THE FITCHBURG"—DIRECT-CONNECTED—GIRDER BED



Sizes 7" by 18" to 22" by 42". Revolutions 80 to 250.

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|                   |                          |    |          |
|-------------------|--------------------------|----|----------|
| D. Con. or Belted | Girder Bed as above      | To | 300 H.P. |
| " "               | Tangye Bed as below      | "  | 800 "    |
| " "               | Tandem Girder            | "  | 300 "    |
| " "               | Tandem Tangye            | "  | 800 "    |
| " "               | Cross Girder             | "  | 750 "    |
| " "               | Cross Tangye             | "  | 1500 "   |
| " "               | High-Speed Horizontals   | "  | 250 "    |
| " "               | Single Cylinder Vertical | "  | 400 "    |
| " "               | Steeple Comp'd Vertical  | "  | 400 "    |

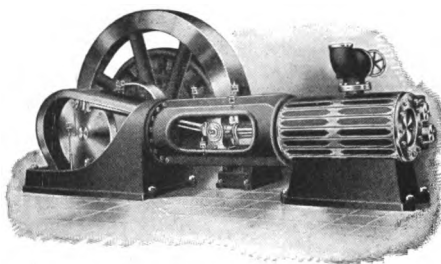
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Details for any size given on application.

### "THE FITCHBURG"—DIRECT-CONNECTED—TANGYE BED



Sizes 12" by 18" to 30" by 48". Revolutions 80 to 250.

## FULTON IRON WORKS

Established 1852

Incorporated 1871

MAIN OFFICE AND WORKS, ST. LOUIS, MO.

**BUILDERS OF ALL TYPES OF CORLISS STEAM ENGINES AND FULTON-TOSI DIESEL TYPE OIL ENGINES**

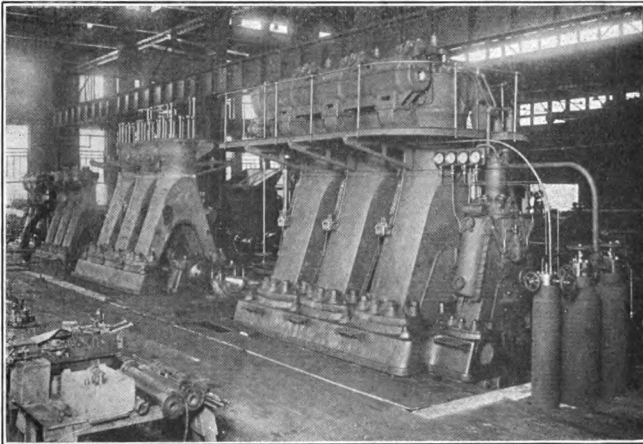
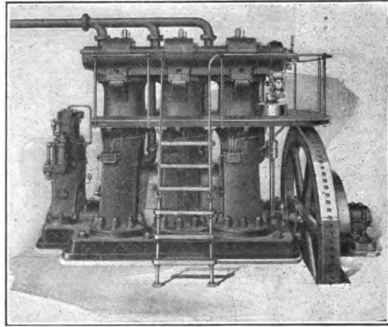
### FULTON-TOSI OIL ENGINES (Diesel Type)

The Fulton-Tosi Four-Cycle Oil Engine is built in the vertical form, "A" frame, and in two, three and four cylinder arrangement. The engine is designed to operate on the cheapest petroleum, crude or fuel oils, or tar oils, with greatest reliability and economy, and as ignition is insured by the heat of compression, no hot bulb, electric spark, or other exterior means of ignition is required.

The engine may be started up from cold within one minute, without any troublesome or time-consuming preliminaries. The operation of the engine is comparatively quiet, very clean and perfectly safe, permitting of its installation almost anywhere. Tanks for the storage of fuel oil may be buried under buildings, drive-ways, or in any other convenient location, without interfering with the use of the space above for other purposes.

The Fulton-Tosi Four-Cycle Oil Engine is built in sizes ranging from 100 B.H.P. in two cylinders to 800 B.H.P. in four cylinders. These engines are suitable for any power purpose, including electric light and power plants, water works, flour mills, textile mills, irrigation plants, etc. Where the requirements as to regularity of speed are extremely exacting, we recommend the selection of an engine with at least three cylinders.

Bulletin 800 giving details will be gladly forwarded upon request.



Diesel Engine Erecting Floor

### FULTON-CORLISS ENGINES

"Fulton Corliss" Steam Engines are built in all types and sizes up to 3000 H.P. For engines of a higher speed than the limit of Corliss engines with releasing gear, we also build the Fulton Four Valve Side Crank Engines which maintain the high efficiency for which the "Fulton Corliss" is noted.

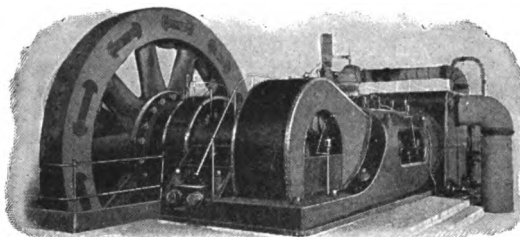
*"Over sixty years of successful manufacturing"*

# THE HOOVEN, OWENS, RENTSCHLER COMPANY

HAMILTON CORLISS ENGINE WORKS

HAMILTON, OHIO

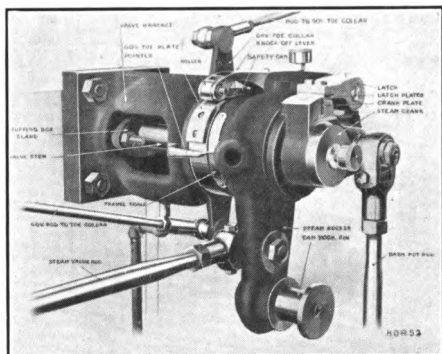
CORLISS ENGINES, SLOW AND MEDIUM SPEED WITH RELEASING GEAR; CORLISS HIGH SPEED ENGINES WITH NON-RELEASING GEAR; HIGH DUTY PUMPING ENGINES; UNIFLOW AIR AND GAS COMPRESSORS; GAS AND "GASTEAM" ENGINES; BLOWING ENGINES; SUGAR MACHINERY AND SPECIAL CAST IRON AND SEMI-STEEL CASTINGS.



Tandem Compound Corliss Rolling Mill Engine

**CORLISS ENGINES:** We build a complete line of Corliss Engines in simple, duplex, tandem compound, cross compound in both horizontal and vertical types, condensing and non-condensing. They can be arranged for driving electrical machinery either direct or belted connection, also for other power purposes such as belt drive, rope drive or any other practical system of drive. Com-

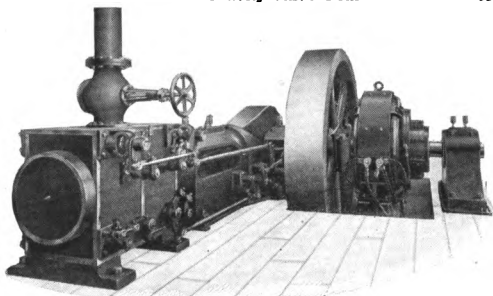
pressors, Blowing Engines, Pumps, etc., can be attached either tandem or opposed method.



Hamilton Corliss Gravity Valve Gear

**HAMILTON CORLISS GRAVITY VALVE GEAR.** This Gear is furnished on our Heavy Duty and Box Girder releasing gear type of engines. It operates positively and noiselessly at speeds up to and including 160 R.P.M. No springs necessary as latch drops into place without their application. Latch, cam levers and other parts subject to stresses are steel forgings, thus producing a non-breakable gear.

**CORLISS HIGH SPEED ENGINES:** Built in simple or compound units and can be operated at speeds up to and including 200 R.P.M. These engines embody Corliss valves operated by a non-releasing gear. The stroke of these engines is shortened so as to give a piston speed equal to that employed in modern steam engine practice. Our inertia type of governor placed in fly wheel, possesses many excellent features not contained in any other governor. This governor gives a perfect regulation and is sensitive to all load changes.



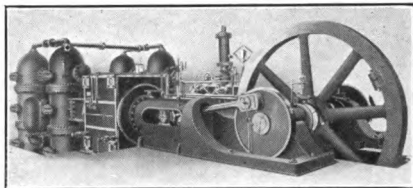
Simple High Speed Engine



## THE HOOVEN, OWENS, RENTSCHLER COMPANY

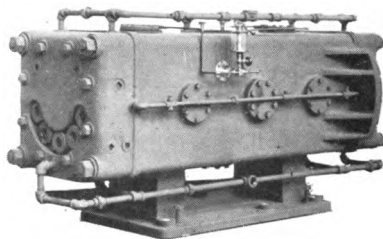
### **PUMPING ENGINES AND PUMPS:**

Are built in horizontal and vertical types. Pumps can be attached to horizontal engines either in tandem or opposed manner. Pump chambers are of cylindrical form bolted down to heavy cast iron sole plates. Valves are mounted on dome shaped valve decks. The valves open vertically instead of parallel and at right angles to the flow of water thereby eliminating trouble and wear in the valves.

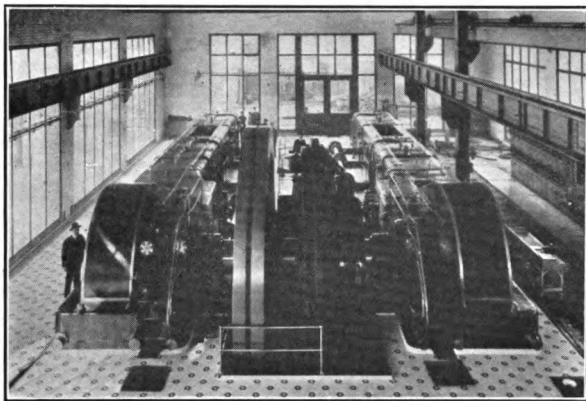


**Hamilton High Duty Pumping Engine**

**UNIFLOW COMPRESSORS:** Are built for compressing air and also for gas. Design permits of large valve openings, both suction and discharge. Suction taken through cylinder barrel, discharge through valves in heads. Mechanical drive for valves is dispensed with entirely. Cylinder heads permit large area for cooling, thereby increasing the efficiency. No pre-heating, no pre-expansion and no reduction in volume by reason of wire-drawing when passing through suction valves is encountered in this type of compressor. Can be attached to any type of prime mover.



**Hamilton Uniflow Compressor**



**Hamilton Gas Engine**

**HAMILTON GAS AND "GASTEAM" ENGINES:** Are the most economical prime movers being built. The "Gasteam" engine consists of a combination of two engines, gas and steam respectively. They are mounted on one shaft. Gas engine economy and steam engine reliability are derived from this wonderful combination. Steam side carries all load fluctuations, while gas side continually operates under full load conditions, thereby maintaining a correct heat balance throughout the cycle.

### **SUGAR MACHINERY AND HEAVY CASTINGS**

Our shop facilities are such that we are in a position to handle any kind of work: none too large, none too small. Let us help you solve your problems and offer suggestions.

Offices in all large cities.

Write for Bulletin.

## McINTOSH & SEYMOUR CORPORATION

AUBURN, N. Y., U. S. A.

### BRANCH OFFICES

NEW YORK CITY, 50 Church Street

BOSTON, 94 Pearl Street

ST. PAUL, 707 Commerce Building

CLEVELAND, 14230 Euclid Avenue

CINCINNATI, 901 4th National Bank Building

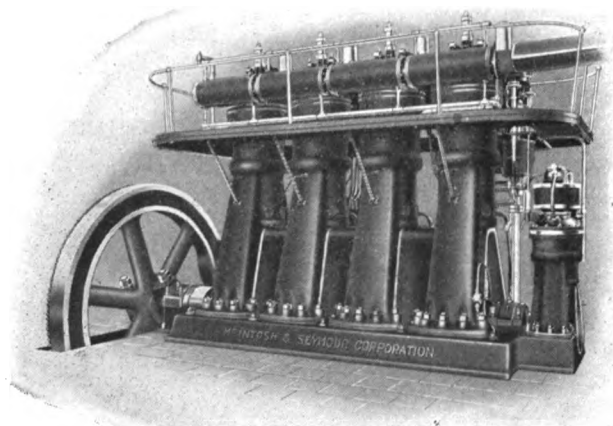
KANSAS CITY, New York Life Building

PITTSBURGH, 1601 Arrott Building

WASHINGTON, 707 Evans Building

CHARLOTTE, N. C., 800 Realty Building

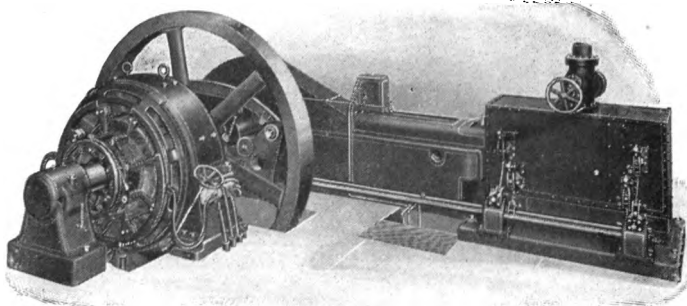
### DIESEL OIL ENGINES AND STEAM ENGINES



**McIntosh & Seymour Diesel Oil Engine, Type A, 500 Brake Horse Power**

Our Diesel OIL ENGINES are built from the standard designs of the "Aktiebolaget Diesels Motorer." This Swedish Company has placed large numbers of these engines, both marine and stationary types, in highly successful operation throughout Europe.

These engines are built in a wide range of sizes and are adapted for mechanical drive or direct connecting to electric generators. Send for descriptive bulletins.



**One of Two 150 Kw. Units in Madison Ave. Bldg., N. Y. City**

McIntosh & Seymour STEAM ENGINES are known the world over for their excellence of design, materials and workmanship, economy, reliability and long life.

**STEAM ENGINES IN VARIOUS SIZES FOR VARIOUS PURPOSES**

**25 to 9000 horse power**

# MURRAY IRON WORKS CO.

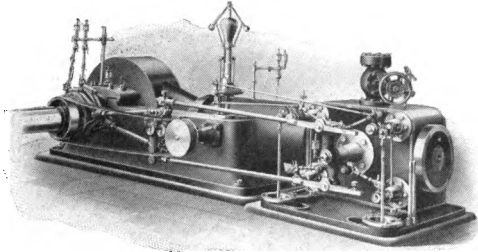
1870

1914

BURLINGTON, IOWA

**COMPLETE POWER PLANTS—CORLISS ENGINES—BOILERS OF ALL TYPES—AIR COMPRESSORS, PUMPING ENGINES, FEED WATER HEATERS, ROCKING GRATES**

## MURRAY CORLISS ENGINES



Murray Rolling Mill Type Corliss Engine

Murray Corliss Engines are built either with girder frame, tangye frames or rolling mill frames of our patented design. The Standard Murray Corliss is a girder frame engine built in sizes up to 18x42 inches, and capacities ranging from 50 to 600 H.P. Murray Tangye Frame Corliss Engines for extra heavy duty are built in sizes from 16x36 inches upward. Our Rolling Mill Type Frame for

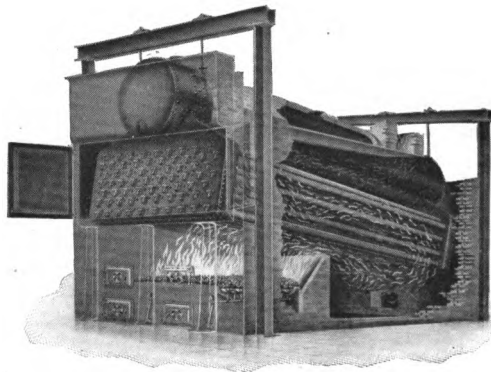
high pressures and high speeds is built for engines from 12x24 inches upwards. Capacities range from 100 to 1300 H.P. Tandem and Cross Compound Engines are built for any load required. Murray Minor Corliss Engines, 20 to 70 H.P., are suitable for the smaller mills and factories. Ask for Catalogue No. 65.

**Points of Superiority:** A. Excellence of materials. B. Best workmanship. C. Rigid inspection, D. Superiority of design in the following particulars of detail: 1. The latest and most approved forms of frames, suitable for every purpose. 2. High speed, ball-bearing governor with improved safety stops. 3. A form of cylinder whereby the exhaust passages are insulated from the cylinder by a dead air space. 4. Improved valve motion. 5. Improved dash pots, under the cylinder plate, or bolted to side of cylinder. 6. Improved forms of steam and exhaust valves. (Double ported when specified.) 7. An improved form of piston. 8. Fly wheels made in halves, free from initial strains. 9. Vertically adjustable outer pillow block with oil-retaining rim. 10. Broad pyramidal main bearing and cylinder feet or sole plates. 11. New and improved style connecting rod. 12. Improved cross head with adjustable shoes running in bored guides. 13. Smallest possible clearance volume.

## HIGH PRESSURE MURRAY BOILERS

The essential features of the Murray Water-Tube Boilers are safety, simplicity, accessibility and economy of fuel and space. They are of the straight tube, all steel type, no cast iron being used in any part subject to tensile strain. They are made up of front and rear headers connected together with wrought circulating tubes and a top steam drum or drums, the whole set with an incline to the rear in an inexpensive brick setting, those of 200 H.P. capacity and over being supported independently of the brick work by a cast iron column and steel girder galleys frame as shown.

We do not confine our customers to one type, but build the Tubular, the Water-Tube and the Internal Furnace. These different types of boilers are described in the following: Water-Tube—Catalogue No. 60; High Pressure Horizontal Tubular—Series "D," No. 4 Pamphlet; Standard Horizontal Tubular—Series "D," No. 6 Pamphlet; Scotch Marine, Vertical and Portable—Series "D," No. 10 Pamphlet.



Murray Water-Tube Boiler, with Suspension Rigging

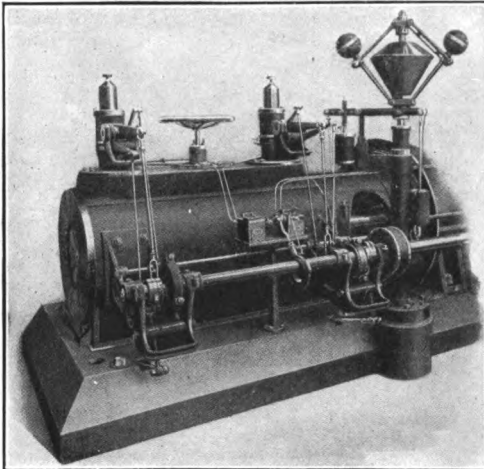
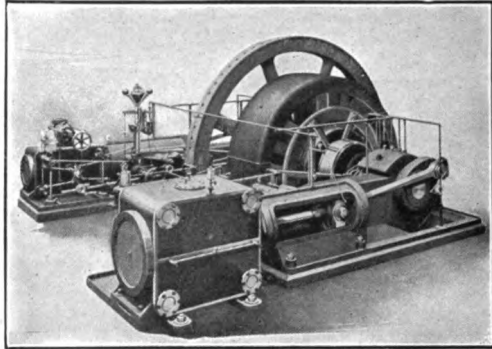
## THE NORDBERG MFG. COMPANY

MILWAUKEE, WIS.

**ENGINEERS, DESIGNERS AND BUILDERS OF HIGH EFFICIENCY CORLISS ENGINES, UNIFLOW ENGINES, POPPET VALVE ENGINES, AIR COMPRESSORS BLOWING ENGINES, STEAM AND ELECTRIC HOISTS, PUMPING ENGINES AND STEAM STAMPS.**

**CORLISS ENGINES:** This Company builds a complete line of the highest grade Corliiss Engines of standard design and also Nordberg full stroke Corliiss Engines (cut-off up to 8/10 of stroke under full control of governor), high speed Corliiss Engines and heavy duty Corliiss Engines.

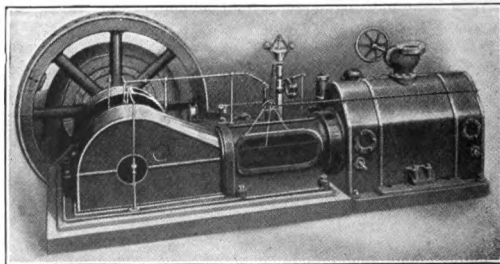
Nordberg Engines are built in horizontal, simple, duplex, tandem compound, cross compound and vertical types; for driving electrical machinery, for belt drive, rope drive and general power purposes, and for combination with compressors, blowing engines, pumping engines, etc.



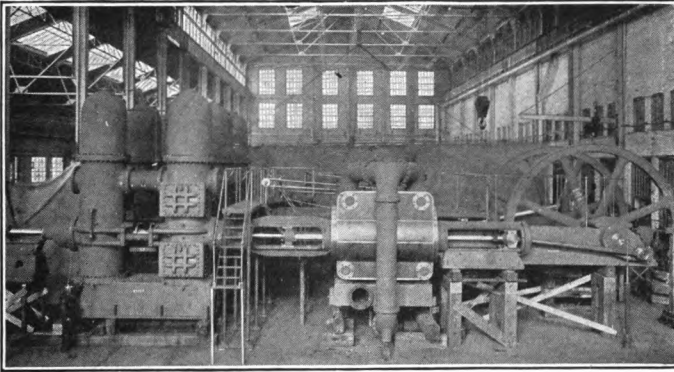
**NORDBERG EQUILIBRIUM POPPET VALVE ENGINES.** This Company has manufactured poppet valve engines for 25 years. The fundamental advantage of the poppet valve engine is its ability to use steam at high pressures and high superheat, secondly a poppet valve remains steam tight for an indefinite period. This is demonstrated by a recent test on the famous Champion Copper Co. Compressor (which holds the world's record for steam economy). The high pressure cylinder which receives steam at 250 lbs. pressure is fitted with Nordberg Equilibrium Poppet Valve gear. A short time ago the full steam pressure was turned on the cylinder, and not the slightest trace of steam could be noticed at the indicator cocks, demonstrating fully the absolute tightness of the valves, even after ten years of service. The latest advance in compound engines is the combination of poppet high pressure valves and Corliiss low pressure valves. Compound Condensing Engines of this type give economies of 10 lbs. per h.p. hr., using superheat.

**NORDBERG UNIFLOW ENGINES:** The Uniflow Engine, invented over 25 years ago, has been developed in Germany, largely by Prof. Stumpf, and in this country, a Uniflow Engine to meet American conditions, has been designed by Mr. B. V. Nordberg, and over 150 tests under all steam conditions have been made. The primary advantage demonstrated by these tests is the enormous overload capacity of the Nordberg Uniflow Engine with flat steam consumption curve. By actual comparison with the performance of the best known types of American Turbines, the Nordberg Uniflow Engine not only has a lower steam consumption curve, but the percent increase in steam consumption with underloads is also far less than with the turbine.

We are building complete Nordberg Uniflow Engines, and also equipping existing engines with Uniflow cylinders. For superheated steam, Uniflow Engines are fitted with poppet valves.

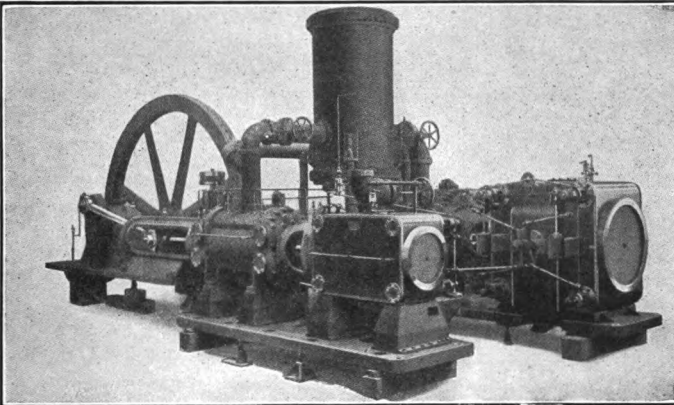


## THE NORDBERG MFG. COMPANY

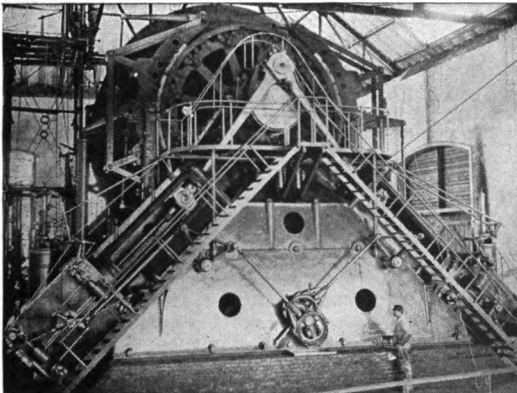


**NORDBERG PUMPING ENGINES:** The photograph shows a Nordberg Pumping Engine, built for the Utah Copper Company, capacity 10,000 gallons per minute against 265 ft. head.

The Nordberg Mfg. Company builds the highest duty compound, triple and quadruple expansion pumping engines with or without the Nordberg regenerative feed water heating system with which the highest steam economies in the world have been obtained.



**NORDBERG COMPRESSORS:** The above photograph shows a Nordberg horizontal cross compound two-stage full Corliss Air Compressor. Besides full Corliss Compressors, which are built in the largest sizes and have shown, for example at the Champion Copper Co. Mine, the highest recorded steam economy in the world, the Nordberg Mfg. Company also build a line of small compressors ("SC" Type) in capacities from 300 ft. up for belt and motor drive. The compressors are compactly designed, fool-proof, enclosed and self-contained with automatic lubrication.



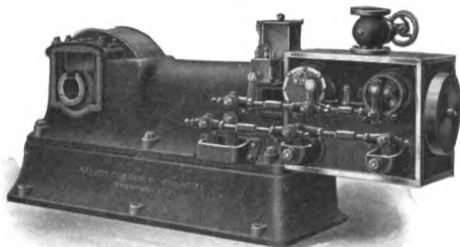
**STEAM AND ELECTRIC HOISTS:** This photograph shows the largest hoist in the world, furnished to the Tamarack Mining Co., Mich. The Nordberg Mfg. Co. has made more hoists for great depths than all other builders in the U. S. combined. Nordberg Electric Hoists are built in all sizes.

Other products of this Company include Nordberg Steam Stamps, Blowing Engines, Condensers, Vacuum Pumps and special machinery.

## REEVES-CUBBERLEY ENGINE CO.

TRENTON, N. J.

BUILDERS OF STEAM AND GAS ENGINES



Horizontal Single-Cylinder Side-Crank Corliss Engine.  
Gear Side

### SINGLE-VALVE SIDE AND CENTRE-CRANK ENGINES

The valve used as a standard in all of our single-cylinder and vertical cross-compound engines is of the piston type. It is simple in design, light in weight, quiet in operation and automatically follows the wear of the valve rings, maintaining at all times a tight valve, perfectly balanced and practically frictionless.

All engines are equipped with a self-oiling system of lubrication (patented). This system is of the greatest advantage when the service is hard and continuous. All the principal bearings of the engine are oiled from a system of piping and adjustable sight feeds are provided for each bearing.

Side and Center-Crank Single Valve Types are built in sizes ranging from 50 to 320 horsepower.

### CORLISS ENGINES

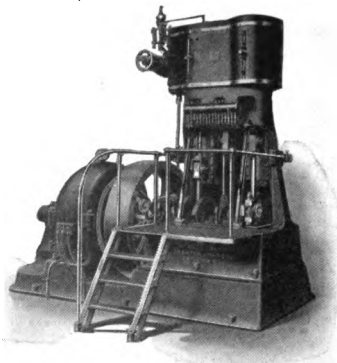
Our four-valve non-releasing gear Corliss engines give much closer regulation and higher efficiency, particularly under varying loads, than the releasing slow-speed type. Recommended for units of 100 horsepower and over, to operate on the usual steam pressures.

These Corliss-type engines are built horizontal, simple and tandem and cross-compound, in sizes from 100 to 750 horse-power.

### VERTICAL CROSS-COMPOUND ENGINES

Reeves' Vertical Cross-Compound Engines are automatic high and medium speed, fully enclosed, having cranks set opposite or at 180 degrees. They occupy small floor space and are especially adapted for installations having steam pressure of 120 pounds and above when operating non-condensing, and for pressures of 90 pounds and above when operating condensing; can be used to advantage running non-condensing when exhaust steam is used for heating or manufacturing purposes.

Suitable for power purposes and for the standard electrical generator requirements, as well as for driving centrifugal pumps, etc. The design is such that this type of engine is very rigid. Built in center-and-side-crank types and in sizes ranging from 50 to 600 horsepower.



Vertical Cross-Compound Engine.  
Side-Crank Type

### VERTICAL SINGLE-CYLINDER ENGINES

Especially recommended for their compactness, freedom from vibration and noise when running at high speed; for their perfect regulation and for their durability. They are designed to carry any steam pressure up to 150 pounds and speeds vary from 250 to 500 revolutions per minute, depending on the size of the engine. Occupy very small floor space and are built enclosed. They can be furnished singly or in combination of two, with cranks coupled, or in one piece. Are built in sizes from 15 to 150 horsepower.

We also build a line of Marine and Stationary Gas and Gasoline Engines.

# SKINNER ENGINE COMPANY

ERIE, PA.

Branches in 33 Cities

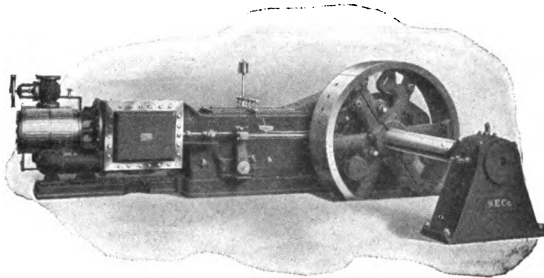
**BUILDERS OF HIGH GRADE AUTOMATIC ENGINES**

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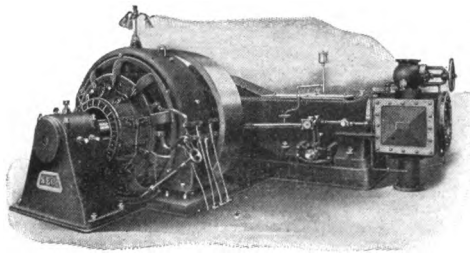
## SKINNER ENGINES

**Side and Center Crank, Single Cylinder, Tandem and Cross Compound**

All Skinner Engines are equipped with steam-tight valves, and therefore maintain their economy for years.



A single-valve Skinner Engine will give better economy after six months' operation than any High Speed Four-Valve.



The Skinner Double Eccentric Compound is more economical at half load than a high speed four-valve at full.

At full load, it is 20% more economical than the four-valve.

It pays its additional cost in six months' time, and does this with only seven joints in the valve gear, as against twenty-nine in most four-valves.

These engines have made several American records for economy after a year's operation.

# TROY ENGINE & MACHINE CO.

TROY, PENNSYLVANIA

STEAM ENGINES OF THE CENTRE-CRANK TYPE EXCLUSIVELY

## TROY SELF-OILING ENGINES

Sizes—2 to 100 H. P.

Our standard products are given in the list below. Column B gives the maximum usual pressure and Column C the number of sizes made.

| Stock Title  | B      | C  |
|--|--------|----|
| Troy Vertical Automatic Engines . . . . .          | 80-160 | 13 |
| Troy Horizontal Automatic Engines . . . . .        | 80-160 | 8  |
| Troy Vertical Direct-Connected Engines . . . . .   | 80-160 | 13 |
| Troy Horizontal Direct-Connected Engines . . . . . | 80-160 | 8  |
| Troy Vertical Throttling Engines . . . . .         | 80-160 | 14 |
| Troy Horizontal Throttling Engines . . . . .       | 80-160 | 9  |
| Troy Vertical Low-Pressure Engines . . . . .       | 10- 40 | 11 |
| Troy Horizontal Low-Pressure Engines . . . . .     | 10- 40 | 7  |

All the above are made either enclosed and self-oiling, or open with gravity lubrication.

The economy of operation and maintenance of Troy Self-Oiling Engines is better than obtained in many common types of steam engines. The original design has proved excellent and progressiveness in important details has made the Troy Engine gratifyingly successful. The following brief mention of construction details are of interest.

Balanced Valves that are built steam tight and remain steam tight. Neither loss by leakage nor expense for repairs.

Long Connecting Rods, lessening the friction on the guides, thus saving power and securing longer life for the bearings.

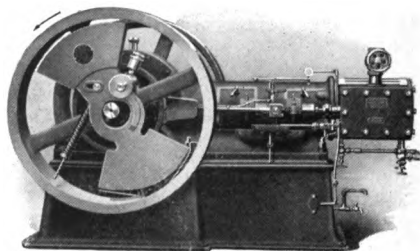
Patent Locking Device for the crank pin bolts, making accurate adjustment easy, and providing strength and security at this important point in the engine.

A Self-Oiling System (patented) that thoroughly lubricates, saves oil and operates automatically. The bearings run in oil, minimizing wear, and the cost of lubrication is less. The oil pump and the check valve are designed especially for this service and are particularly strong features, as they should be.

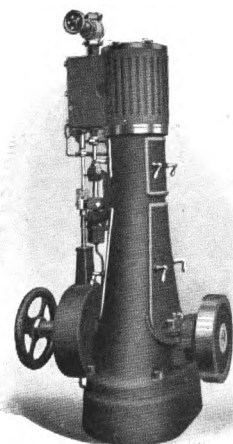
The Babbitt and the Brass used in bearings are made by Troy formulas which have been worked out to provide the most durable bearings.

Automatic Governor Engines have a regulation which varies less than 2 per cent.

Each order receives personal attention so as to adapt the engine in the nicest possible manner for the service it has to perform. This has particular importance when the engine has special details in construction for direct connected or similar work, and always insures the purchaser getting just the equipment needed.



Horizontal Automatic Type  
for Belted Service



Special Type of Vertical Throttling  
for D. C. to Fan or Blower



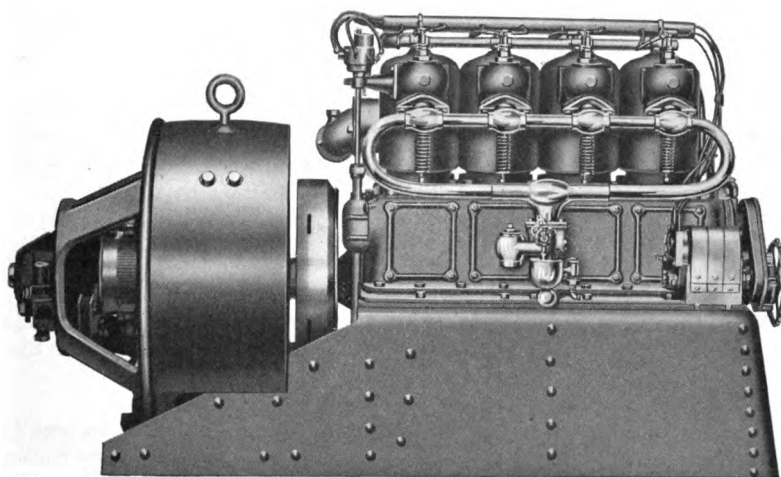
# BLOUNT ENGINEERING COMPANY

(Successors to Blount and Lovell)

100-102 HIGH ST., BOSTON, MASS.

GENERAL MACHINE WORK  
GEAR CUTTING

MACHINE DESIGNERS  
EXPERIMENTAL WORK



Special 20 K.W. Direct Connected Generating Set

## BLOUNT ENGINES

employ

Correct Design, Good Material, Very Careful Construction

| Type E 5½x6½" Iron Base                              | 2 cyl. | 3 cyl. |        | 4 cyl. |        |        | 6 cyl. |        |        |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Type F 5½x6½" Aluminum Base                          | Type E | Type E | Type G | Type E | Type F | Type G | Type E | Type F | Type G |
| Type G 5½x8" Iron Base                               | Type E | Type E | Type G | Type E | Type F | Type G | Type E | Type F | Type G |
| H.P. at 425 R.P.M. ....                              | 12     | 17     | 25     | 25     | —      | 36     | 36     | —      | 50     |
| H.P. at 500 R.P.M. ....                              | 14     | 21     | 28     | 30     | 30     | 40     | 42     | 42     | 58     |
| H.P. at 600 R.P.M. ....                              | 17     | 25     | 33     | 35     | 35     | 46     | 50     | 50     | 68     |
| H.P. at 700 R.P.M. ....                              | —      | 28     | 37     | 38     | 38     | —      | 56     | 56     | 78     |
| H.P. at 750 R.P.M. ....                              | —      | —      | —      | —      | 42     | —      | —      | 60     | —      |
| H.P. at 800 R.P.M. ....                              | —      | —      | —      | —      | 45     | —      | —      | 65     | —      |
| Weight of complete engine. ....                      | 1100   | 1350   | 1500   | 1500   | 1200   | 1700   | 2150   | 1600   | 2400   |
| Diameter of Fly wheel. ....                          | 20"    | 20"    | 20"    | 20"    | 20"    | 20"    | 20"    | 20"    | 20"    |
| Length of base on foundation. ....                   | 40"    | 48"    | 48"    | 56"    | 56"    | 56"    | 72"    | 72"    | 72"    |
| Length over all. ....                                | 56½"   | 64½"   | 64½"   | 72½"   | 72½"   | 72½"   | 88½"   | 88½"   | 88½"   |
| Depth of base at after end from shaft centre. ....   | 6¾"    | 6¾"    | 6¾"    | 6¾"    | 6¾"    | 6¾"    | 6¾"    | 6¾"    | 6¾"    |
| Depth of base at forward end from shaft centre. .... | 10¼"   | 10¼"   | 10¼"   | 10¼"   | 10¼"   | 10¼"   | 10¼"   | 10¼"   | 10¼"   |
| Height from centre shaft. ....                       | 25"    | 25"    | 30½"   | 25"    | 25"    | 30½"   | 25"    | 25"    | 30½"   |
| Width of base. ....                                  | 20"    | 20"    | 20"    | 20"    | 20"    | 20"    | 20"    | 20"    | 20"    |
| Width between foundation timbers. ....               | 14½"   | 14½"   | 14½"   | 14½"   | 14½"   | 14½"   | 14½"   | 14½"   | 14½"   |
| Diameter of propeller shaft. ....                    | 1½"    | 1½"    | 1½"    | 1½"    | 1½"    | 1½"    | 1½"    | 1½"    | 1½"    |

10 K.W.-45 K.W. Direct Connected Generating Sets

## NATIONAL METER COMPANY

ESTABLISHED 1870

84-86 CHAMBERS ST.

NEW YORK CITY

### BRANCH OFFICES:

CHICAGO, 1227 Wabash Ave.

BOSTON, 159 Franklin St.

CINCINNATI, 224 East 4th St.

PITTSBURG, 4 Smithfield St.

ATLANTA, 3d Nat. Bank Bldg.

LOS ANGELES, 411 S. Main St.

SAN FRANCISCO, 141 New Montgomery St.

WINNEPEG, MANITOBA, 229 Spence St.

LONDON, Caxton House

**MANUFACTURERS OF CROWN, EMPIRE, NASH, GEM, PREMIER, AND EMPIRE COMPOUND WATER METERS.**

### THE CROWN

is a positive displacement water meter of the rotary piston type. This meter has been made and sold by us for over thirty years. It is substantial, durable and accurate. We make this meter in sizes from  $\frac{5}{8}$ " to 6".

### THE EMPIRE

is a positive displacement water meter of the oscillating piston type. It is the most accurate, durable and generally satisfactory meter manufactured today. Owing to the simple construction of its measuring chamber the accuracy of this meter can be maintained indefinitely at a minimum cost. It is made in sizes from  $\frac{5}{8}$ " to 6".

### THE NASH

is a positive displacement water meter of the disc type. This meter has been on the market for over twenty-five years. The reinforced disc, frost proof bottom and straight reading register are a few of its many superior advantages. The meter is made in sizes from  $\frac{5}{8}$ " to 6".

### THE GEM

is a water meter of the velocity or current type and has been made by us since 1870. It is intended for service when a large and rapid delivery of water is of special advantage. The Gem has the greatest capacity of any meter of its type on the market. It is made in sizes from 2" to 12".

### THE PREMIER

is a water meter constructed of a Venturi Tube and a by pass on which an accurate, positive displacement meter is installed. This meter is intended to measure the complete supply of a city or other large service. The Premier is made in sizes from 8" to 48".

### THE EMPIRE COMPOUND

is a water meter constructed by combining our Empire and Gem meters. It will measure with great accuracy large and small flows, and will operate most satisfactorily under greatly varying conditions. The Empire section is always open. The Gem section is controlled by a check valve which opens automatically when called upon to measure a stream larger than the capacity of the Empire. This meter is made in sizes from 2" to 12".

**OUR METERS FORM A STANDARD BY  
WHICH ALL OTHERS ARE JUDGED.**

No matter what your conditions may be, we can offer you the

**BEST METER FOR YOUR SERVICE**

# NATIONAL METER COMPANY

## NASH GAS ENGINES

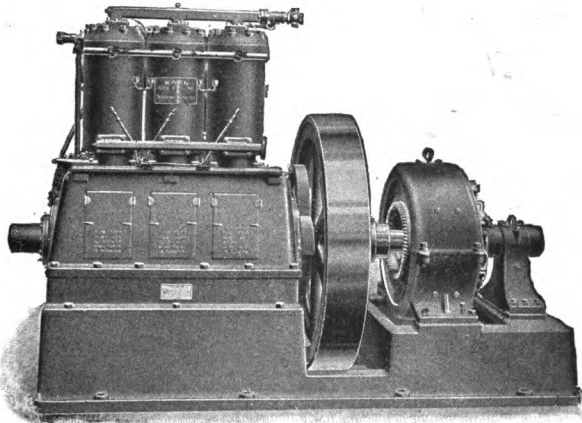
to operate on

Illuminating Gas, Gasoline or Producer Gas

Simple, Silent, and Efficient

The engine throughout is the embodiment of the latest and best ideas of gas engine design and construction.

Is of very liberal proportions and high grade in every detail. The NASH has many exclusive and valuable features.



All sizes of NASH engines are of the four cycle type and are fitted with throttling or hit and miss governors as may be selected or best suited to the conditions.

The National Meter Company is the originator of the throttling governor for gas engines and the NASH was the first gas engine to be equipped with it.

In regulation, the NASH Gas Engine is on a parity with that of the best steam engines.

Due to its high economy, closeness of regulation and quietness of operation it meets a great range of power requirements.

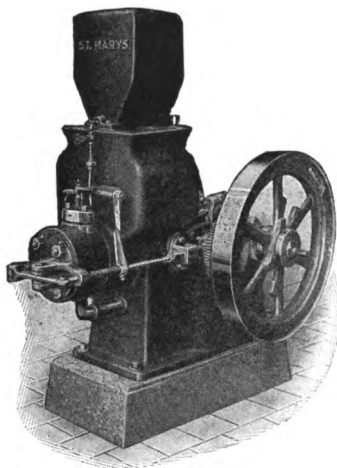
### COMPARATIVE COST OF POWER OF VARIOUS TYPES OF ENGINES

| TYPE OF ENGINE                       | Fuel             | Price           | Fuel Consumed per B. H. P. per Hour | Cost per H. P. per Hour | Cost 100 H. P. 10 Hrs. |
|--------------------------------------|------------------|-----------------|-------------------------------------|-------------------------|------------------------|
| Simple Slide Valve Steam....         | Bituminous Coal  | \$3.50 per ton  | 8 lbs.                              | .0124                   | \$12.40                |
| Compound Condensing Corliss          | Bituminous Coal  | 3.00 per ton    | 3 lbs.                              | .0045                   | 4.50                   |
| Steam Turbine.....                   | Bituminous Coal  | 3.00 per ton    | 3 lbs.                              | .0045                   | 4.50                   |
| Oil Engine.....                      | Fuel Oil         | .036c. per gal. | 1/12 gal.                           | .003                    | 3.00                   |
| Nash Gas Engine.....                 | Natural Gas      | 25c. per M.     | 10 cu. ft.                          | .0025                   | 2.50                   |
| Nash Gas Engine on Producer Gas..... | Coke             | 5.00 per ton    | 1 1/4 lb.                           | .0031                   | 3.10                   |
| Nash Gas Engine on Producer Gas..... | Lignite          | 1.75 per ton    | 2 lbs.                              | .00175                  | 1.75                   |
| Nash Gas Engine on Producer Gas..... | Anthracite Buck  | 4.00 per ton    | 1 lb.                               | .002                    | 2.00                   |
| Nash Gas Engine.....                 | Illuminating Gas | 75c. per M.     | 18 cu. ft.                          | .0135                   | 13.50                  |
| Nash Gasoline Engine.....            | Gasoline         | 16c. per gal.   | 1/10 gal.                           | .016                    | 16.00                  |
| Electric Power.....                  |                  | 3c. per KW hr.  |                                     | .0225                   | 22.50                  |

## THE ST. MARYS MACHINE CO.

ST. MARYS, OHIO

MANUFACTURERS OF CRUDE OIL, KEROSENE, DISTILLATE GAS OIL  
ENGINES AND PRODUCER GAS ENGINES



### H. O. OIL ENGINES

Run on any kind of oil that flows.

**Distinctive Features:** 1. Engines 12 H. P. and above are air started. Starting is positive and cannot fail. 2. The engine governs on the fuel direct, therefore the mixture is right and automatic. 3. Ignition is automatic and cannot fail. 4. No batteries to freeze up or run down. 5. No magneto to get out of adjustment. 6. No ignitor to corrode or get out of time. 7. No spray nozzle to stop up. 8. No carburetor to adjust. 9. No hot tube to be too hot, or too cold, or blow out. 10. Temperature does not affect starting. 11. Cold will not reduce the power of the H. O. type. 12. We use no water to retard combustion, and no water can get into the cylinder. 13. Engine will not overheat on normal load. 14. All cams are specially hardened and cannot get out of adjustment. 15. There are no carbon deposits in the H. O. type. 16. Pre-ignition is absolutely impossible, as ignition is positively timed and there are no carbon deposits to become incandescent. 17. Combustion is certain and complete. Back-firing never occurs in the H. O. type. 18. Each charge is completely burned; therefore there are no exhaust pipe explosions. 19. Regulation is perfect, as we use the best construction and govern on fuel direct. 20. Fuel consumption is in direct proportion to the load. 21. Combustion is perfect and there is no smoke at the exhaust.

**Starting:** Starts instantly when wanted. (1) Turn on the oil. (2) Open the air valve. (3) The engine is running, shut off the air valve.

**Stopping:** (1) Shut off the oil.

**Fuel:** Use any fuel you can purchase conveniently. It runs satisfactorily on any oil that will flow.

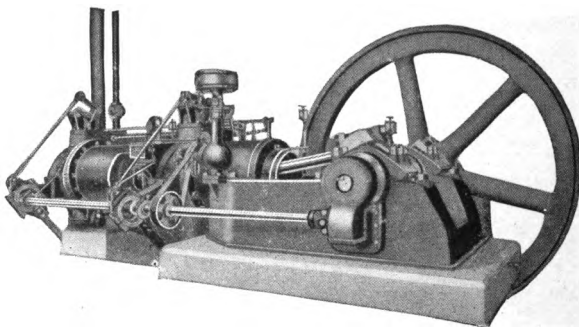
**Fuel Consumption:** .6 lb. per H. P. hour.

**Principle:** In every oil there is a portion of light hydrocarbons. Our device acts as a still separating these light hydrocarbons from the heavier parts of the oil. These light hydrocarbons ignite very easily, and at a temperature much lower than the combined oil, so easy that the heat of compression ignites it. The process of distillation is carried on independently, for each suction stroke.

**Sizes:** Built in all sizes up to 150 H. P. Crude Oil.

### HEAVY-DUTY TANDEM OIL AND GAS ENGINE

This engine operates on the four-stroke cycle. There are two cylinders arranged tandem, each having one single-acting piston. The two pistons are connected by a water-cooled piston rod, the front piston serving as a cross-head carrying the wrist pin. This engine lends itself to various combinations for increasing the power of a plant.



We manufacture these natural gas and producer gas engines in all sizes to 480 H. P.

# DE LA VERGNE MACHINE CO.

1123 EAST 138TH STREET, NEW YORK CITY

DE LA VERGNE CRUDE OIL ENGINES  
REFRIGERATING MACHINERY

ICE MACHINES

## TYPE "FH" CRUDE OIL ENGINE

De La Vergne oil engines have been developed over a period of 20 years in the United States to meet American conditions.

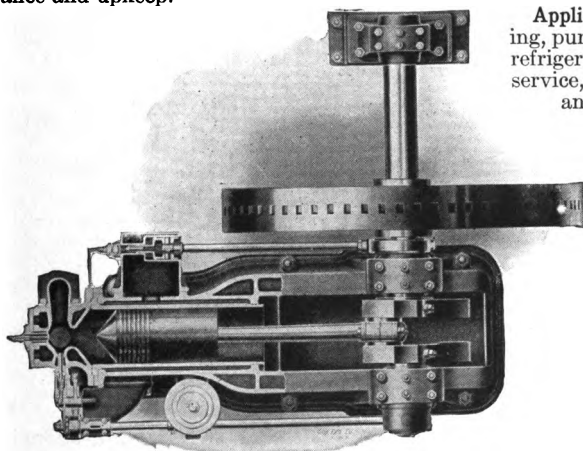
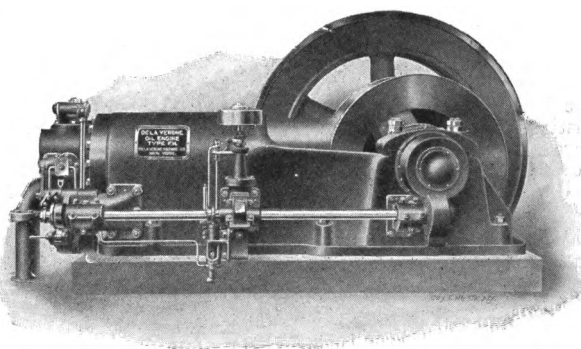
They operate on the lowest grades of crude oil and also on waste residual tar by-products which cannot be economically used in any other known way. This ability to operate on the cheapest grades of fuel together with their remarkably high economy makes the De La Vergne oil engine the most economical form of power known.

They are of the medium pressure type and the wear and tear caused by high compression and explosion pressures are entirely eliminated. Every part is within easy reach from the floor and the design is distinguished by its few parts and remarkable simplicity throughout.

Skilled engineers are not required and the engine operates with only ordinary attention.

**Guaranteed**—to operate on any commercial fuel or crude oil produced in the United States or in Mexico; to develop 16 B. H. P. hours per gallon of fuel when running at  $\frac{3}{4}$  to full load.

**Advantages**—no excessive pressures; low cost of operation; no standby losses; no handling of coal or ashes; absolute reliability; minimum expense for attendance and upkeep.



Plan View

**Application**—electric lighting, pumping, air compressors, refrigerating machines, factory service, mining, etc., in fact, any place where power is required.

**Sizes**—Built in one, two and four cylinder units from 65 B.H.P. to 800 B. H.P.

Full details in bulletin No. 138—sent on request.

## THE OTTO GAS ENGINE WORKS

MAIN OFFICE—PHILADELPHIA, PA.—WORKS

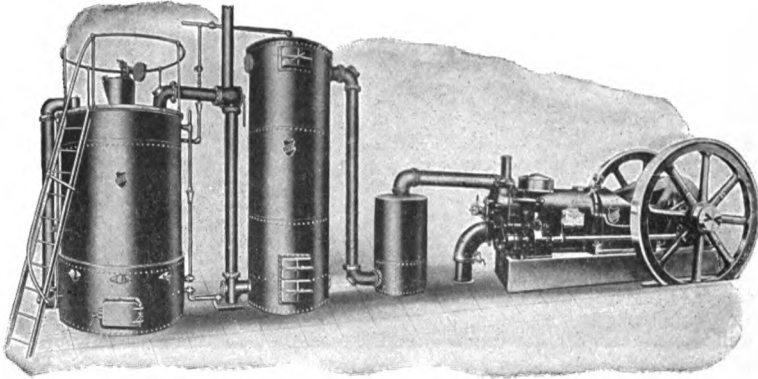
NEW YORK

CHICAGO

**MANUFACTURERS OF GAS, GASOLINE AND OIL ENGINES; SUCTION GAS PRODUCER PLANTS.**

### OTTO ENGINES

designed to operate on illuminating or natural gas, producer gas, gasoline, distillate and alcohol, are adapted for every power requirement. They are especially suitable for pumping stations; stationary and portable power plants; hoisting rigs; high and low voltage electric lighting plants. They include direct-gear air compressors, stationary and portables and heavy duty engines for manufacturing industries.



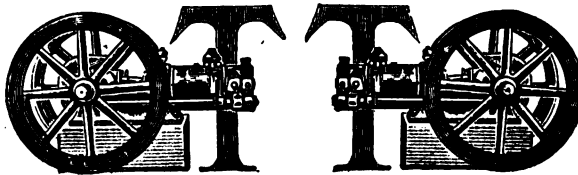
### THE OTTO SUCTION GAS PRODUCER

converts the heat of anthracite coal, charcoal or coke into producer, or semi-water gas. This contains a certain amount of CO and H, with a heat value of from 130 to 140 B.t.u. per cubic foot. The loss due to purifying and cooling is approximately one-fifth. Therefore the efficiency at the engine is extremely high, and the fuel cost, low. Records of a brake horsepower on less than one pound of fuel are frequent, and a brake horsepower at no more than one and one-quarter pounds of fuel is guaranteed.

These engines are absolutely safe and have the unqualified approval of the National Board of Fire Underwriters.

OTTO Gas and Gasoline Engines are built in all sizes from 2 to 300 H.P.

Ask for Catalog stating your requirements



We issue catalogues or bulletins covering each group of engines, therefore in asking for catalogue state your requirements so that we will know what to send.

## THE COAL & COKE BY-PRODUCTS CO.

421 WOOD ST., PITTSBURGH, PA.

**MANUFACTURERS OF THE "ERNST" PATENTED GAS CLEANING APPARATUS, AND CONTRACTORS FOR COMPLETE GAS POWER PLANTS AND GAS CLEANING PLANTS.**

**BITUMINOUS PRODUCER GAS AND BLAST FURNACE GAS CLEANED FOR GAS ENGINE AND FUEL PURPOSES:** It is absolutely necessary, for the efficient use of gases such as producer and blast furnace, that it be thoroughly cleaned, especially when required for power purposes.

**MECHANICAL SCRUBBING:** Mechanical washing or scrubbing has been recognized to be the most reliable and effective method of cleaning gas.

**"ERNST" GAS CLEANING APPARATUS, PATENTED AUGUST 18th and SEPTEMBER 29th, 1908: OTHER PATENTS PENDING:** The machine here illustrated is part of a gas cleaning plant in a large gas power installation. The results from this plant have been very gratifying, so much so that we received a repeat order. Machines operating in this country and in England.

**PERFECT AND CONTINUOUS OPERATION GUARANTEED:** The gas, which has preferably been partially cooled, enters the machine at "A" and travels in a sinuous or zig-zag course past a series of rotating beaters or blades and shelves and between stationary members and shelves to the outlet "B." "C" is the water inlet supply. The gas in its passage through the machine is subjected to a violent beating and whirling action from the beater blades and is compelled to take a sinuous course around successive shelves and is intimately brought into contact with water on the surface of the stationary shelves; further in passing each rotating shelf, the gas is subjected to a fine spray thrown therefrom directly across the space through which the gas has to pass. In this way the gas is thoroughly scrubbed and by centrifugal action, the impurities are thrown out, finding their way to a water seal below.

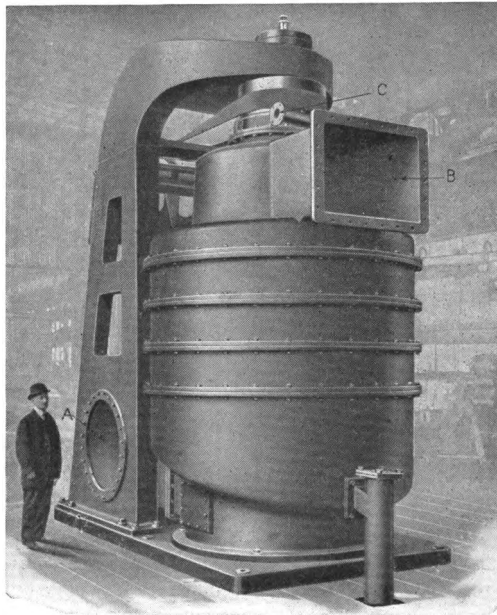
### **SELF CLEANING:**

The machine being of a vertical type with specially arranged parts so that no accumulation of impurities can take place, is self cleaning; it is simple in construction, requiring practically no attention during operation.

**SMALLER POWER AND WATER CONSUMPTION:** Because of the principle employed in this machine, and the distance through which the gas has to pass and be operated on and the successive use of the water in a downward course, a much smaller quantity of water is required than in any other apparatus. The vertical type and efficient construction, the moving parts being, as it were, suspended, reduces the driving power to a minimum and the machine has proved to be superior to any other apparatus on the market as to cleanliness of delivered gas, low driving power and water consumption.

**CAPACITY:** The machines are built in single units of from 500 H.P. to 5,000 H.P. each.

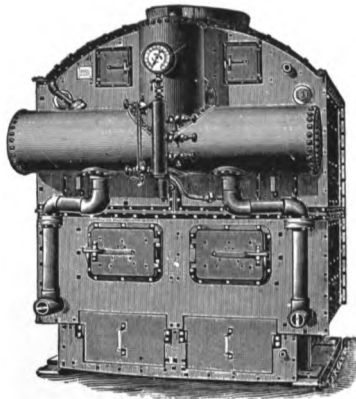
**INQUIRIES:** With inquiries state if for new or existing plant, the capacity of plant, kind of gas to be cleaned and if producer, type and coal used, also nature of service.



## ALMY WATER TUBE BOILER CO.

PROVIDENCE, R. I.

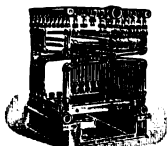
SECTIONAL WATER TUBE BOILERS FOR EVERY MARINE PURPOSE



Exterior—Class B, C, D

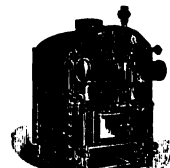
The Almy Boiler is in every respect a Pipe Boiler being constructed of Extra Strong Iron Pipe and Malleable Iron Fittings. As the threads are standard size, repairs may be made conveniently in almost any part of the world. Due to design, expansion and contraction is entirely taken care of and sudden change of temperature has no bad effect on the heating surface. 75 lbs. to 100 lbs. of steam may be raised from cold water within seven minutes with perfect safety.

We build six classes or types of boilers—A, B, C, D, E and Z. Type is determined according to the desired duty. Sizes run from 2.7 to 56 sq. ft. of grate surface and 87 to 2,000 sq. ft. of heating surface.



Interior  
Class A, B, C

An evaporation of 11.92 lbs. of water from and at 212° per pound of combustible has been shown on a 45 H.P. boiler—rate of combustion



Exterior  
Class A

14 lbs. per square foot of grate surface per hour. The same boiler under forced draft evaporated 7.89 lbs. of water per pound of coal—gauge pressure 153 lbs., feed temperature 56°, rate of combustion 35.98 lbs. of coal per square foot of grate surface per hour.

The large amount of fire box heating surface receiving direct heat is an important feature. In our class D and E boilers, there is 90% more of such heating surface than in a flat sided fire box of equal dimensions.

These boilers are very satisfactory with oil burners as quite a number of installations on the Pacific Coast have proved.

Our business is principally marine but we occasionally furnish boilers for stationary use. "Knocked down" boilers may be shipped in 400 lb. packages and under.

Catalogue containing full description of construction will be sent on application.



# THE BASS FOUNDRY & MACHINE CO.

FORT WAYNE, IND.

ESTABLISHED 1853



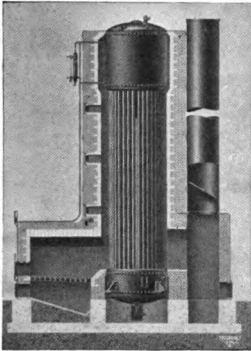
Corliss Engine

## HEAVY DUTY AND GIRDER FRAME CORLISS ENGINES

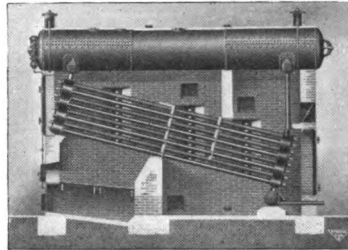
for

Factory, Rolling Mill and Direct  
Connected Service

Built in simple, tandem com-  
pound and cross compound types.



Vertical Water Tube Boiler



Horizontal Water Tube Boiler

## HORIZONTAL AND VERTICAL WATER TUBE BOILERS

In Sizes from 50 to 600 H.P.



Horizontal Tubular Boiler with Longitudinal  
Seams, Butt Joint, Quadruple Riveted

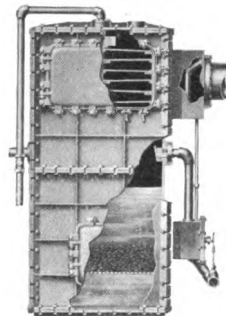
## HORIZONTAL TUBULAR BOILERS

Built to Meet the Requirements of all  
States and Cities

We also manufacture

TANKS, STACKS, STAND PIPES AND  
STEEL PLATE WORK OF ALL KINDS.  
HEAVY DUTY PISTON VALVE EN-  
GINES, HEAVY ROPE WHEEL DRIVES,  
CAR WHEELS AND GREY IRON CAST-  
INGS OF EVERY DESCRIPTION.

IRON AND STEEL FORGINGS.



## OPEN FEED WATER HEATERS

Both Horizontal and  
Vertical

Either cast iron or steel  
construction.

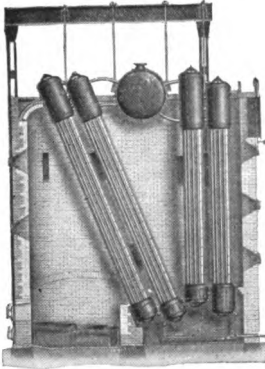
Built in all sizes.

## THE BIGELOW COMPANY

New York Office 85 Liberty St. WORKS AND MAIN OFFICE, 76 RIVER ST. NEW HAVEN, CONN. Boston Office 141 Milk St.

**FIRE TUBE AND WATER TUBE STEAM BOILERS; DIGESTERS, CRYSTALLIZERS, VULCANIZERS, AND HEAVY PLATE STEEL WORK.**

### THE BIGELOW-HORNSBY WATER TUBE BOILER



**Cross Sectional View  
Through the Brickwork**

combustion, as furnace is correctly shaped and of ample size.

Greatest flexibility, both as to construction and in steaming qualities.

No cast iron used in any portion of the boiler proper.

Constructed both as to workmanship and material in accordance with the most advanced boiler practice.

Features of the Bigelow-Hornsby Boiler that meet the requirements of Modern Power House Practice:  
Unlimited size of units.

Small ground space occupied.

Coldest water meets the coldest gases.

Direct heating surface about four times as great as the average water tube boiler.

All parts, both external and internal, readily accessible.

All boiler tubes perfectly straight.

Circulation of water and liberation of steam unrestricted.

Very dry steam, also ample room for superheaters where required.

High continuous economy due to extreme cleanliness of the most efficient heating surface.

Arrangement of baffling is unique, causing the gases to pass over the heating surface in thin streams and uniformly at every point.

Furnace arrangement is ideal for securing perfect

### THE BIGELOW-MANNING BOILER

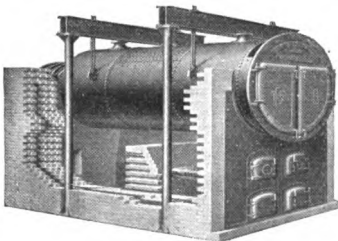


**Standard  
Manning**

This type of boiler can be constructed suitable for 200 pounds working pressure or more, in units up to 500 H.P. The shell sheets being away from contact with the fire permits the use of any thickness of shell necessary for high pressures. Another feature conducive to safe operation is the firm support of the boiler, which is accomplished in the Bigelow-Manning type by having a firm foundation upon which the cast iron base rests, without relying upon the support of setting walls or expensive structural work.

The economical evaporative performance of the Bigelow Manning Boiler is remarkable. All radiant heat from the fuel bed is absorbed directly by water-heating surface, the distribution of the furnace gases over the heating surface is practically uniform, the superheat furnished is varied by changing the water level, there are no losses due to the infiltration of air in the setting and stand-by losses are comparatively small, occupying per H.P. much less ground space than other types.

### HORIZONTAL RETURN TUBULAR BOILER



**1 Beam Suspension Type of H. R. T.**

The advantages of compactness and efficiency, large direct heating surface, easy cleaning, large liberating surface, perfect circulation and minimum liability and ease of repairs are well known features of this type of boiler.

Our boilers are constructed in the most approved manner; we adopt the very highest type of professional and mechanical service, endeavoring to maintain the highest possible standard of efficiency, and believe our facilities for boiler construction are without a parallel.

## COATESVILLE BOILER WORKS

COATESVILLE, PA.

PHILADELPHIA, Morris Bldg.

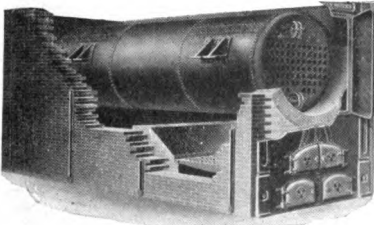
NEW YORK, 30 Church St.

**ENGINEERS AND MANUFACTURERS OF ANYTHING IN WHICH STEEL PLATE CONSTRUCTION IS ESSENTIAL: HIGH DUTY BOILERS, STEEL TANKS FOR ALL PURPOSES, DIGESTORS, STAND PIPES, RIVETED PIPE, DRYERS, BLAST FURNACES, STEEL STACKS, KILN SHELLS, ETC.**

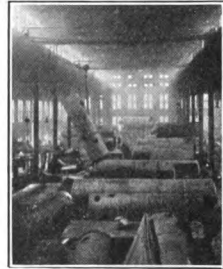
Our shops are located next adjoining two of the largest steel plate mills in the United States, thus we can always get steel plates on the shortest notice. Our equipment is complete and modern and includes oxy-acetylene welding.

**BOILERS** in stock ready for immediate shipment: Coatesville High Duty

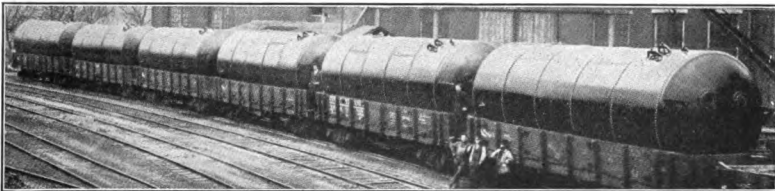
Return Tubular Boilers, 125 pounds working pressure. Coatesville new design Vertical Boilers. Coatesville Wrought Steel Heating Boilers for Apartments, Schools, Churches, etc. Special catalogues on request.



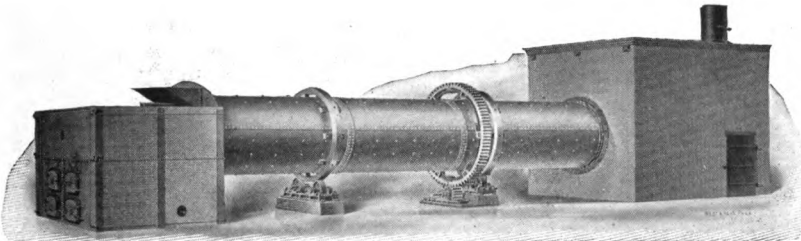
Tubular Boiler Setting



Testing Floor



**STEEL TANKS** a specialty for oil, air, water and all other liquids. Every kind for every purpose. We have built some of the largest in the Country. List of "What We Make" will be furnished on application.



Direct Fire Tankage Dryer

**DRYERS.** Direct Fire, Steam Jacketed and Indirect Steam. For drying Garbage Tankage, Fish Scrap, Chemicals, Sand, Crushed Stone, and By-Products. Catalogue on request.

We solicit your inquiries.

Your orders whether large or small will be given best attention.

## D. M. DILLON STEAM BOILER WORKS

Established 1870

Incorporated 1906

MAIN OFFICE AND WORKS: FITCHBURG, MASS.

NEW YORK OFFICE  
30 Church Street

SOUTHERN REPRESENTATIVE  
J. S. Cothran, Charlotte, N. C.

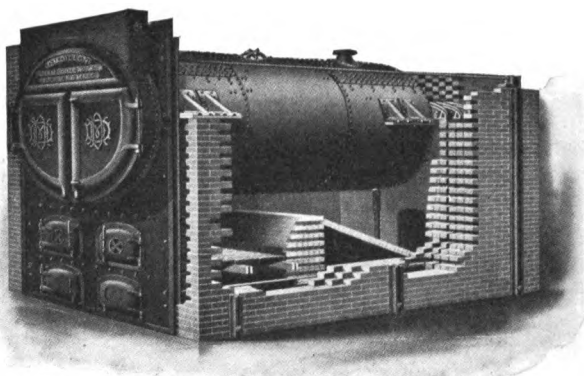
We are equipped to furnish

- |                    |  |
|--------------------|--|
| <b>BOILERS</b>     | For high pressure service, 150 to 200 lbs. working pressure: all fire tube types such as Horizontal Tubular, Straight Upright, Manning Upright, Locomotive and Marine. |
| <b>STACKS</b>      | Guyed and Self Supporting, any diameter and height, any thickness of material.   |
| <b>TANKS</b>       | Any capacity, type, pressure or vacuum, any thickness of material.   |
| <b>KIERS</b>       | Special construction for any class of work, high or low pressure.  |
| <b>VULCANIZERS</b> | Special construction for various classes of work, jacketed if desired, high or low pressure.   |
| <b>SMOKE FLUES</b> | For any size or type of boiler, any thickness of material.   |
| <b>PLATE WORK</b>  | All kinds.   |

**High Pressure Boilers and Large Units**—To meet the increasing demand for higher pressures and larger units, we have gone carefully into the matter of thick shell plates and have found that when used in boilers of proper design and construction, they are perfectly reliable in every way.

We have built many horizontal return tubular boilers for 200 lb. working pressure using shell plates  $\frac{3}{4}$ " thick, planed down to about  $\frac{7}{8}$ " at the girth seams, and the years of satisfactory service they have given, prove that our contention as to the use of thick plates is correct; also that our design and construction methods are the best.

We build horizontal return tubular boilers in sizes from 10 horse power (24" diam.) to 450 horse power (108" diam.)



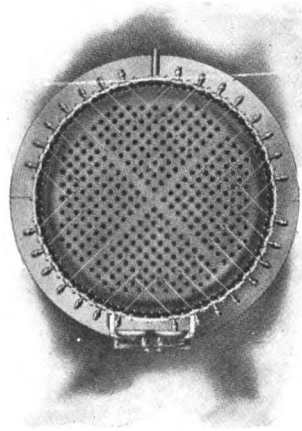
Horizontal Return Tubular Boiler

Illustration shows all steel boiler (nozzles, brackets, manhole covers, yokes, etc., all of steel) set with full overhanging steel front of special design: note the tie rods above and below fire line: also stiffeners to prevent warping.

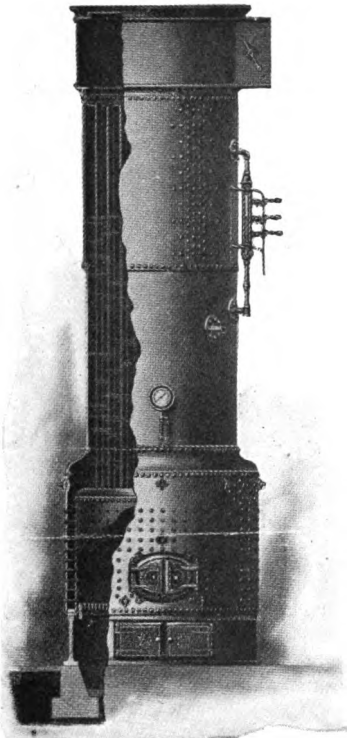
## D. M. DILLON STEAM BOILER WORKS

### MANNING BOILERS

The Manning type of upright boiler (see cut) is perfectly adapted to all the requirements of the highest pressures and the largest units, because no plate subject to tensile strain comes in contact with the fire. It is the best boiler for turbines on account of its ability to furnish steam superheated 25 to 50°: the amount of superheat may be increased by lowering the water line or by using longer tubes.



Horizontal Section of Manning Boiler, Showing Multiple Plan of Handholes



Manning Boiler, Showing Elevation and Section and Solid Cast Iron Base Upon which It Sets

It is well suited for any locality regardless of water conditions when made with the multiple plan of cleaning handholes which give access to every part of the crown sheet (see cut). The outside furnace plate is sometimes carried a little higher and a 12"x16" manhole placed opposite the crown sheet, thus providing additional facilities for cleaning and internal inspection.

This boiler being self contained, requires no setting: consequently the expense of maintenance is low, and the efficiency is uniformly high.

We build Manning boilers in sizes from 50 horse power to 500 horse power for any working pressure.

## EDGE MOOR IRON COMPANY

EDGE MOOR, DELAWARE

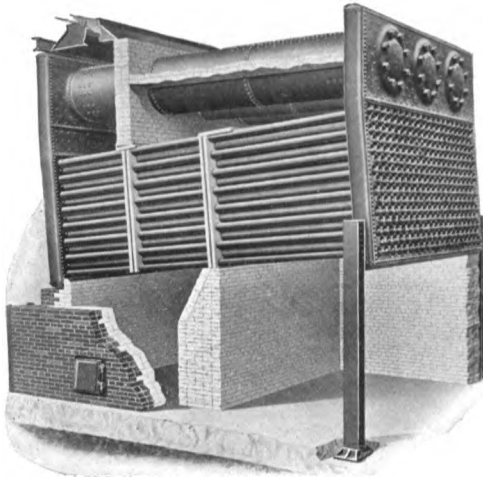
111 Broadway  
NEW YORK

79 Milk Street  
BOSTON

Otis Building  
CHICAGO

Rialto Building  
SAN FRANCISCO

### BUILDERS OF THE EDGE MOOR WATER TUBE BOILER



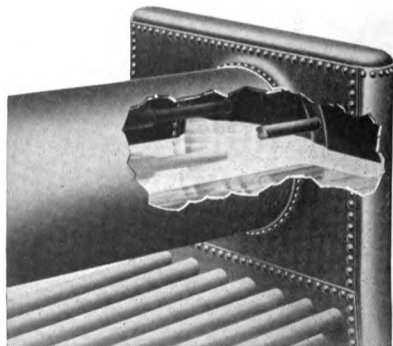
Note the special header construction, the horizontal drums, the elliptical handholes, the steel supports, and the efficient manner of baffling

When a boiler is desired for the exacting service of a modern power plant, the square feet of heating surface and the strength of parts are not the only important factors to be considered. While a boiler appears to be a simple piece of apparatus structurally, its internal performance is far more complex than is generally realized; and it is this complex action that warrants more attention to the details of design.

The special features of the Edge Moor boiler cannot be explained in the limited space of an advertisement. Those interested in steam boilers and in tests of unusual performance should send for our illustrated bulletins. They will also do well to ask for preliminary information from one of our sales offices before preparing the final specifications for a proposed plant; for by doing so, they will obtain valuable suggestions without any obligation.

Edge Moor boilers are built in sizes from 100 to 1000 horse-power.

*Write our nearest office.*



The header construction provides such an increased steam liberating area that boilers can be safely and efficiently forced to several times rated capacity

# E. KEELER COMPANY

Established 1864

WILLIAMSPORT, PA.

NEW YORK PHILADELPHIA PITTSBURGH CHICAGO NEW ORLEANS DALLAS SAN FRANCISCO

**WATER TUBE, TUBULAR AND MARINE BOILERS. STEEL PLATE WORK**

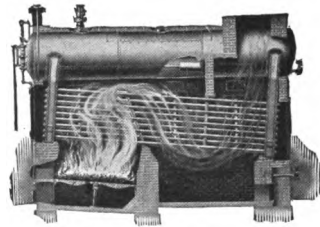
## WATER TUBE BOILERS

### Standard Type

The arrangement of furnace, tubes, headers and drum in the Keeler Water Tube Boiler is efficient, accessible and compact. The superior efficiency of the Keeler Boiler rests upon correct proportions of heating and grate surface for the character of fuel to be burned, ample height of furnace, a superior arrangement of baffle walls and a perfect circulation. Every portion of the heating surface is accessible for both external and internal inspection, making it impossible for soot or scale to accumulate undetected. There is ample room between tubes and drum for inspection or repairs. Special side cleaning doors make it possible to observe the condition of the outside surface of the tubes. There is no part of the interior surface that cannot be examined and cleaned.

Keeler Water Tube Boilers are usually built complete and tested in the shop. This reduces the cost of erection, as the boilers are handled as a unit. It also eliminates the dangers due to careless assembling of boilers in the field and makes the erection merely a matter of placing in position and attaching fittings.

Built in units 75 to 1500 H. P.



Standard Type Water Tube Boiler

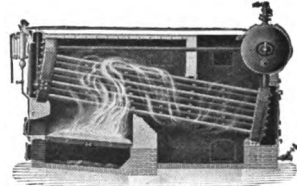
## WATER TUBE BOILERS

### Cross Drum Type

The Keeler Cross Drum Water Tube Boiler is a modification of the standard design, only in the length and location of the drum and the method of connecting it to the headers. This type was developed to meet the demand for a high grade water tube boiler that could be installed in Office Buildings, School Houses, Churches, Apartment Houses, Hotels and boiler rooms generally where ceiling height is limited or where the boiler must be introduced through narrow passageways or restricted openings.

The pressure parts of the boiler are shipped in a knocked down condition, making it possible to install it without cutting through walls and floors in locations that would be wholly inaccessible for almost any other type of boiler. If boilers are to be exported, the cross drum boiler can be handled at much less expense by steamship companies on account of its reduced bulk in a knocked down condition, and the comparatively small weight of the heaviest piece.

Built in units 60 to 600 H. P.



Cross Drum Type Water Tube Boiler

## HORIZONTAL RETURN TUBULAR BOILERS

Our Return Tubular Boiler is the product of fifty years' experience of boiler building. Tube holes are drilled from the solid plate, and not punched small and reamed to size. All seams are thoroughly caulked on the outside, and the end of butt straps are caulked on the inside. Braces are drop forged. Steam outlets, man hole plates, yokes and brackets are of pressed steel.



Horizontal Return Tubular Boiler

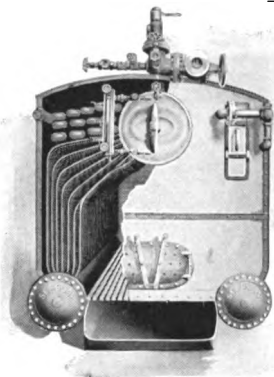
**FIFTY YEARS OF BOILER BUILDING**

Ask for Catalogs

## GAS ENGINE & POWER CO. AND CHARLES L. SEABURY & CO., CONS.

MORRIS HEIGHTS, NEW YORK CITY

STATIONARY AND MARINE BOILERS AND ENGINES



### THE SEABURY WATER-TUBE BOILER

For All Pressures up to 350 Lbs.

DO NOT WRECK THE BUILDING TO REPLACE THE BOILER—The Seabury Water Tube Boiler can be installed in a minimum of space, making it particularly desirable for Office Buildings and Hotels. Is "self contained" requiring no elaborate brick or structural supports. Adapted for anthracite, bituminous, wood or oil fuels.

#### Description

The Seabury Water Tube Boiler is built for safety, durability, maximum heating and grate surface combined with minimum dimensions. These features are obtained by the use of the best ob-

tainable materials—for instance, steel for water drums and tube plates having tensile strength from 55,000 to 60,000 pounds, and solid, drawn steel tubes.

Convenient and adequate facilities are provided for keeping the tubes free from damp ashes and soot on the outside, and to easily clean scale and grease from the inside. The heating surface is greater in these boilers than in any others for the same number of cubical feet of boiler casing. The circulation of water is perfect, and a steady water level is always maintained. Expansion and contraction are provided for, the tubes having a sufficient bend to enable them to come and go with heating and cooling without straining the joints at the ends.

The furnace is surrounded by rows of water tubes so bent and arranged as to leave ample passages for the gases as well as to provide necessary baffling. The tubes are expanded into drilled holes in steam and water drains. *There are no screw joints subject to the intense heat of the combustion chamber.* Over the nests of tubes, on both sides of the steam drum, is located the feed water heater through which the water passes before entering the drum. This heater is constructed of steel pipe and malleable iron return bends, and between heater and drum is interposed a check valve.

The boiler is cased in a substantial sheet steel jacket stiffened with angles on the outside and lined on the inside throughout with magnesia and asbestos, except the ends of the combustion chamber, which are lined with fire brick. The casing is fitted with all necessary fire and cleaning doors.

*The large combustion chamber in a Seabury Boiler makes it very successful for oil burning.*

#### DIMENSIONS, STOCK SIZES

| Length Casing | Width Casing | Hgt. Inc. Crown and Ashpan | Grate Surface | Heating Surface |
|---------------|--------------|----------------------------|---------------|-----------------|
| 30            | 34           | 49                         | 3.5           | 120             |
| 44            | 36           | 61                         | 4.94          | 222             |
| 48            | 54           | 64                         | 9.5           | 333             |
| 58            | 60           | 82                         | 12.25         | 516             |
| 55            | 46           | 58                         | 8.48          | 307             |
| 72            | 51           | 72                         | 12.9          | 521             |
| 78            | 68           | 75                         | 21            | 750             |
| 81            | 92           | 96                         | 33.4          | 1087            |
| 91            | 98           | 100                        | 41            | 1310            |
| 88            | 106          | 103                        | 39.5          | 1649            |
| 96            | 124          | 118                        | 53.75         | 1920            |
| 119           | 135          | 131                        | 77.57         | 2846            |
| 124           | 87           | 105                        | 45            | 1940            |
| 130           | 87           | 119                        | 44.77         | 2152            |
| Special type  |              |                            | 52            | 1650            |
|               |              |                            | 101           | 3300            |

The following fittings are included: Water column complete. Three (3) water gauge cocks. One (1) soot blower. One (1) set of firing tools. Whistle connection. Safety valve. Two (2) blow-off cocks. One (1) grate shaker. Feed check valves. Connection for main steam and auxiliary steam.

All boilers except first two require jet or forced draft to develop full engine power.

Sizes suitable for natural draft on application.



## JOHN MOHR & SONS

349-359 W. ILLINOIS ST.

CHICAGO, ILL.

**GARBE WATER TUBE BOILER, BLAST FURNACES. STEEL LADLES, HOT STOVES, CUPOLAS, FURNACES, MIXERS, CONVERTERS, STERILIZERS, ETC.**

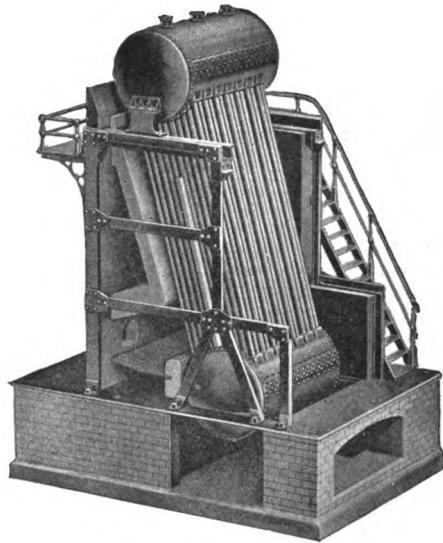
### THE GARBE BOILER

#### Special Advantages

All handholes with their troublesome and expensive gaskets are eliminated, as the tubes are expanded into very large drums which are equipped with the patented pressed "Garbe" Plate. Any tube can easily and quickly be inserted, removed and replaced without disturbing any of the others.

Elimination of all flat surfaces, stay bolts and braces. All parts of Boiler are cylindrical and curved.

All tubes are absolutely straight and nearly vertical, therefore the entire circumference of tube is directly exposed to the gases. The effective heating surface is materially larger than that obtained by horizontal tubes.



Garbe Patent Water Tube Boiler

The upper drum is suspended from a substantial structural frame work, absolutely independent from the mason work. The lower drum is in contact with two slides or guides, thereby allowing free expansion of tubes, equalizing the strain between drums and reducing chances of leakage to a minimum.

The vertical arrangement of tubes allows the steam to develop very freely and to flow by the shortest way possible without changing direction to the upper drum, thereby causing a very rapid circulation. The tubes are distributed over the full length of the Boiler, thus giving a large and uniform steam liberating surface, equal to the full area of the tubes. This vertical arrangement of tubes will do away with local overheating and consequent rupture of the tubes so often occurring in horizontally arranged tubes.

Soot, dust and ashes cannot accumulate on tubes or any part of drum, thereby allowing longer periods of operation without the necessity of cleaning.

Large water capacity, due to the extremely large size of upper and lower drum, insuring a more constant water level than any other Boiler.

The feed water passes through the rear bank of tubes, which have the lowest temperature, to the lower drum and deposits therein all impurities.

Over half of the entire heating surface is effective in liberating steam.

Practically no scale in tubes owing to rapid circulation and vertical tubes.

# THE WICKES BOILER COMPANY

MAIN OFFICE AND WORKS, SAGINAW, MICH.

Sales Offices in Principal Cities

MANUFACTURERS OF STEAM BOILERS

## WICKES VERTICAL WATER TUBE BOILERS AND STEEL CASED BOILER SETTINGS

Water Tube Boilers have proved their efficiency. The need is for very simple water tube boilers. The Wickes Vertical Water Tube Boiler has proven its superiority. **FIRST:** It is constructed entirely of homogeneous material and uses straight tubes. **SECOND:** It operates with high commercial efficiency—the sum of all efficiencies.

Two 12x16-inch manholes open in this boiler—one top—one bottom, inspection and cleaning is a simplified matter. Every tube can be looked through, washed or scraped. Two men can open, turbine and close this boiler in ten hours. A clean boiler promotes efficiency. A boiler easy and quick to clean is likely to be cleaned often and well—that is human nature.

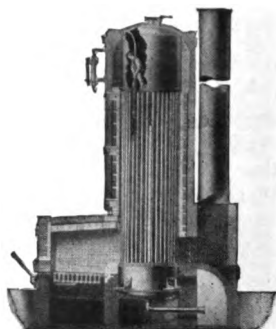
It is easy to clean. If you have ever cleaned a boiler and lamed your back, bruised your knees, and skinned your elbows, you will appreciate the accessible construction of our vertical boiler, which makes cleaning a pleasure. Two men can open, turbine and close the Wickes Vertical Water Tube Boiler in ten hours. You know how long it takes to clean some boilers. When your boilers—any of them—stand idle there is a considerable investment upon which you must charge interest that is not earning money—that is not contributing its share to the profit of your Company. On the contrary it is a drag. The overhead and the unit cost of power is low when using this boiler, for it can always be in service.

High furnace temperature results from Dutch oven. Gases entirely surround and closely scrub heating surface from entrance to release. The gases cannot leave the heating surface. There is no possible chance for short-circuiting. The boiler heating surface absorbs the heat—empty pockets in setting lose heat. There are no empty pockets in this boiler. The steel cased settings are always tight, no cracked, warped, leaky, defective and unsightly settings exist with this type. A steel cased setting is a simple and sure cure for air infiltration losses. The largest preventable losses we have to contend with in boiler efficiency are excess air losses. A very long gas travel—hence long contact with heating surface is provided. Heat absorption is, therefore, assured.

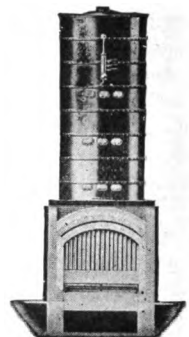
Did you every wreck an engine by pulling water over into it from boiler? Study this boiler. The steam drum gives great height from water line to steam outlet nozzle. This height provides room for separation of the steam from the water which is entrained with it at a point close to the surface of liberation. Since the shell is subject to a mild degree of heat some superheat is effected on the steam leaving this boiler. You do not pull water over from this boiler.

The concentration of the greatest amount of power per square foot of floor space yet achieved can be attained using this boiler.

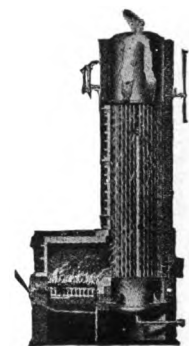
Ask for leaflets—sent free.



Cut Shows Position of Man Cleaning. He Stands Erect. Is it Laborious Compared with Usual Forms?



Steel Cased Setting



Quick Steaming, Delivering Dry Steam

# ILLINOIS STOKER COMPANY

ALTON, ILLINOIS

MANUFACTURERS OF CHAIN GRATE STOKERS, COAL BUNKERS,  
COAL AND ASH-HANDLING MACHINERY

## THE ILLINOIS STOKER COMPANY'S CHAIN GRATE STOKER

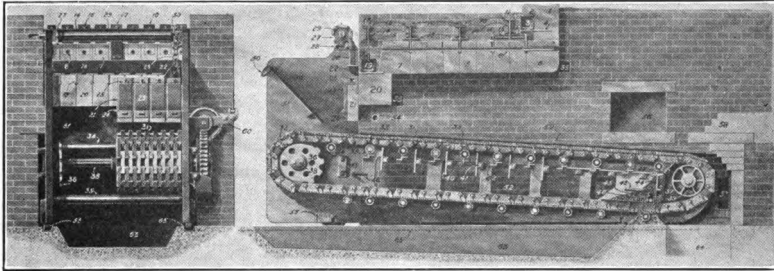
The Illinois<sup>y</sup> Chain Grate stands for lasting and efficient service.

The salient characteristics of its construction are:

Completeness, it being a unit in itself independent of boiler setting; rigidity and perfect alignment of the side frames, due to substantial cross and diagonal braces; large inclined air slots in links; front take-up on chain; adjustable feed gate; efficient system of air baffles; idler drums at rear; and the air regulating dampers beneath the chain.

The advantages of the above features in their order are:

Easy removal of stoker from setting, facilitating furnace repairs; lightness of running, making low operating cost; maximum air supply with minimum sifting of coal; convenience in tightening the chain; simplicity in regulating the depth of fuel bed to suit any draft condition. Absolute exclusion of air at rear of grate where air would be detrimental; the elimination of all link troubles; and finally, perfect control of air distribution in every portion of the grate.



Section Showing Dampers Beneath Chain

Due to this new and exclusive feature, this grate is efficiently adaptable to all conditions of operation from a banked fire to 250% of normal boiler rating. By opening or closing the dampers, just enough of the grate surface is kept active to carry the required load with a short intense fire. Since efficiency is proportional to furnace temperature, it is evident that a short hot fire is far more efficient than a long smoldering one. The closed dampers exclude the excess of air that ordinarily accompanies a short stoker fire, and the CO<sub>2</sub> content of escaping gas can be kept at all times, consistent with the most economical practice.

When the arch shown in the illustration is installed in conjunction with the stoker equipped with these improvements, this combination makes an installation which is hard to be improved upon.

The short front arch precludes the possibility of the coal entering the furnace for a foot or more before igniting, for the main arch being high at the front of the setting, allows the flame to propagate itself freely. Thus the temperature of the short ignition arch is raised, and heat is reflected to where it is required for raising the temperature of the coal, immediately after it enters the furnace, to its point of ignition.

The arch is not only efficient, but is simple in its construction; each row of tile is suspended independently by means of pipes, onto which the fire clay blocks are threaded. Provision has been made for renewing, without disturbing the rest of the blocks, the end tile which is subjected to the most severe usage. Cast-iron pins are inserted in the ends of the pipe, and carry the last block. Should the tile and pin be burned off, a new pin can be inserted in the pipe, and the block replaced. This often saves the cost of a whole new arch. The cast-iron pins being perforated, allow a slight amount of air to be drawn into the setting, thereby keeping the suspension cool. The air being pre-heated by passing through the hot arch, tends to increase the furnace efficiency. These considerations should appeal to every user of stoker arches.

## GREEN ENGINEERING COMPANY

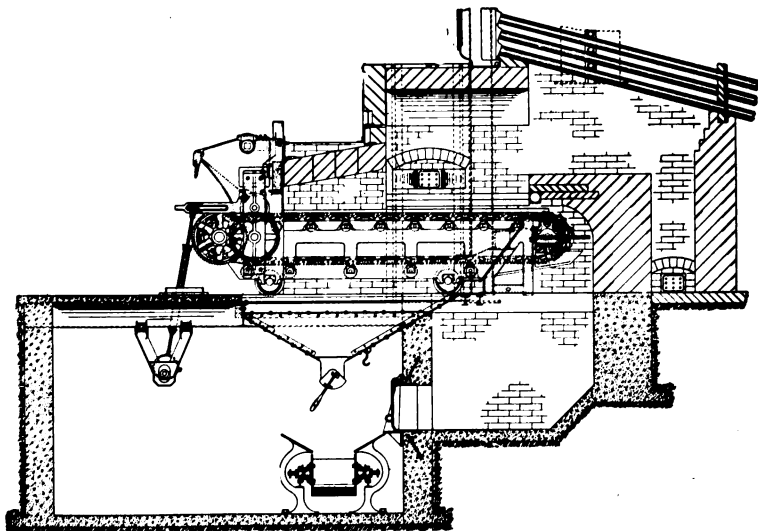
CHICAGO, ILLINOIS

MANUFACTURERS OF GREEN CHAIN GRATE STOKERS; GECO RATCHET ASH DRAGS; GECO PRESSURE WATERBACKS; GECO PNEUMATIC ASH HANDLING SYSTEMS.

### GREEN CHAIN GRATE STOKER

THE GREEN CHAIN GRATE STOKER gives in service a practical demonstration of progressive combustion, the fuel being fed in at the front of the furnace and carried at regulated speed to the rear of the furnace, where, as ashes, it drops into the ash pit to be removed mechanically or by hand. Operation is entirely automatic and continuous. The fuel is ignited and coked at the front end of furnace, air is admitted through automatically cleaned air spaces in grate, and smokeless combustion with low grade fuel is produced. It will quickly pick up or drop a heavy load or economically bank the fire. Labor cost for cleaning furnace is low and the cost for repairs minimized.

#### Green Stoker Applied to a Horizontal Water Tube Boiler



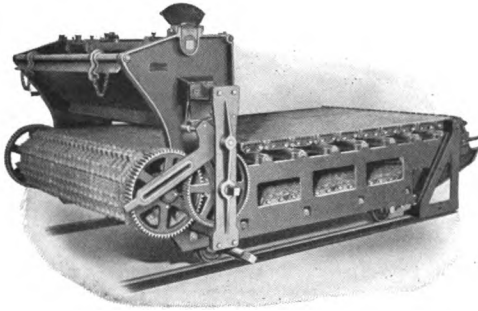
#### Construction

Two types of grates are made adaptable to any make of boiler. The fire bed may be level or sloping. The side girders of frame are entirely away from the fire and arranged to provide an increased air supply. Heavy cast-iron links, thoroughly ventilated, form the firing bed. These links interlock and automatically clear the air spaces without excessive loss of fine coal. The rear cross girder is fitted with a heavy plate on under side upon which ashes accumulate and, in connection with the members just above and below, prevent the passage of air around rear portion of grate, where ashes discharge; and this is further supplemented by dampers, which prevent the leakage of air past the side frames or below the lower part of the chain.

## GREEN ENGINEERING COMPANY

### GREEN CHAIN GRATE STOKER

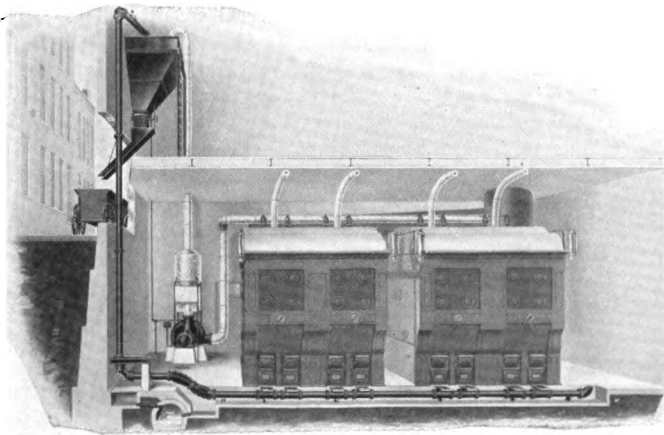
The grates are built in any width and in lengths from 9 ft. up to 12 ft. deep. Driving mechanism consists of ratchet, cast-steel pawls and cast-steel spur gear train babbitted in a special self-contained frame independent of, but bolted to the stoker front side frame. Quick adjustment may be had over a wide range and the source of power may be either above or below the boiler-room floor. A regulating feed-gate permits hard firing and is provided with an easily renewable tile lining, which prevents injury to the gate by fire eating back into coal hopper. The igniting arch is adaptable to any width furnace and easily renewable at low cost. It is flat, ventilated, and it gives uniform ignition the full width of the furnace and allows local repairs at any point without undue loss of use of the boiler.



Stoker withdrawn from Setting

### GECO PNEUMATIC ASH HANDLING SYSTEM

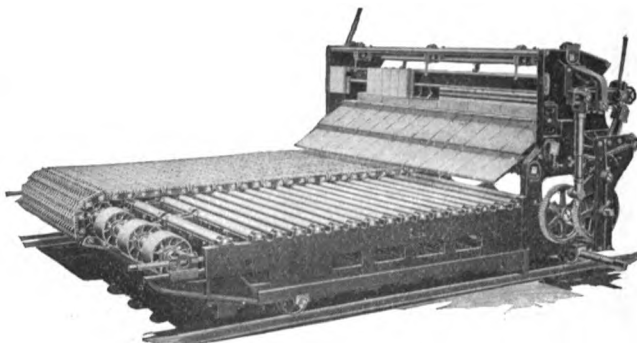
This system consists of a conveyor pipe located convenient to ash pits and provided with openings into which ashes are readily hoed. An air current of high velocity instantly carries the ashes to a separator and storage tank. On entering tank the ashes are automatically sprayed, thoroughly quenched, separated from air and deposited. An exhaustor produces the air current. Tank may be readily emptied by gravity into carts, or cars. One man operates system.



(See also next page)

(Continued from preceding pages)

## GREEN ENGINEERING COMPANY



### "L"-TYPE GREEN CHAIN GRATE STOKERS

The advantages of automatic operation of chain grate stokers have been enviously hoped for by users of low volatile coal for many years, as no other type of stoker can be operated as cheaply or with such uniformly continuous high economy and high capacity.

"L"-Type Green Chain Grate Stokers provide facilities for treating low volatile coals when introduced into the furnace to force their proper ignition and prepare them for complete combustion thereafter. The facilities provided are all automatic, simple, effective, and through wide range, making the apparatus flexible.

The burning of low volatile coal having several constituents is a complex problem of thorough ignition, and in "L"-Type Green Chain Grate Stokers, is solved by three distinct and progressive stages. The first subjects the fuel to radiated heat, liberating and igniting its volatile constituents, a process accompanied by a caking tendency, resulting from the deposit of tarry constituents onto the remaining fuel. The second stage prevents this caking by agitation of the fuel while complete coking without combustion, that is, without introduction of air, is taking place. The third stage begins with the deposit of entirely coked and ignited fuel onto the chain grate surface in a porous, fragmentary condition, permitting the passage there through of ample uniformly distributed air supply. Under these conditions, combustion is readily completed before discharge of the ash. All these processes and operations are automatically performed and can be maintained continuously after the various adjustments provided in the apparatus have been properly set for the particular fuel to be used.

The successes made with over 50,000 H. P. in operation since the introduction of these stokers, bear out the correctness of the theory, design and practical operation of "L"-Type Green Chain Grate Stokers.

# THE MODEL STOKER COMPANY

DAYTON, OHIO

**MANUFACTURERS OF THE MODEL AUTOMATIC SMOKELESS FURNACE AND THE MODEL CHAIN GRATE STOKER.**

---

## THE MODEL AUTOMATIC SMOKELESS FURNACE

An automatic furnace for power boilers which both stokes and keeps the fire clean, insuring constant, complete or smokeless combustion, decided economy, superior utility, durability and low cost of maintenance.

It is the latest advance development of the double or side feed type.

All parts are well protected against destructive heat and readily adjustable to suit requirements. Stoker engine uses only about  $\frac{1}{2}$  of 1% of steam made.

Any or all parts can be operated by hand. Combustion is complete in fire chamber, and there is no smoke even when heat gases pass directly from under the arch to the water surface of boiler.

The improved construction renders it the most durable and most efficient furnace in use. Requires less fuel, less labor and less cost for maintenance for any given duty. Uses successfully any soft coal of feedable size. Responds readily to any variations and will crowd a boiler quickly and strong. Adaptable to any style of boiler and to every class of duty requiring high temperatures.

Coal can be supplied by gravity or by hand and ash removed mechanically or by hand.

### Improved Construction and Operation

The improvements embodied in the Model Automatic pertain to automatic action, simpler and better construction, interchangeability of parts, greater durability, ready access and minimum cost for renewals, adjustability to meet varying requirements due to variations in fuel or of duty, regularity of fire, variable to suit requirements.

Its efficiency and general utility is admittedly unequaled by any other type or make of boiler furnace.

The only stoker which **KEEPS** the fire **CLEANED**.

Other manufacturers of this type claim to remove the ash and refuse and do to some extent, but no other company can claim to **KEEP** the fire clean.

We also manufacture a first class Chain Grate Stoker.

## MURPHY IRON WORKS

FOUNDED 1878

DETROIT, MICHIGAN

**MANUFACTURERS OF THE MURPHY AUTOMATIC SMOKELESS FURNACE.**

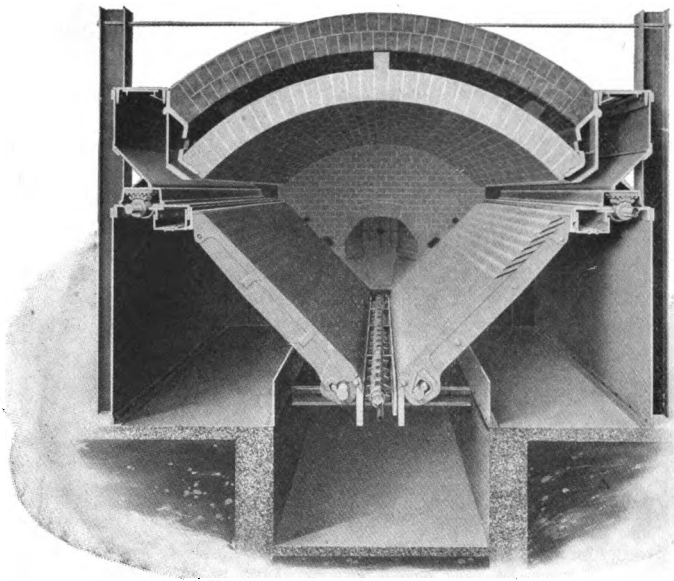
THE MURPHY AUTOMATIC FURNACE is automatic in all its functions. It feeds and distributes the coal and removes the ash and refuse.

It is adaptable to any type of boiler and to units of any size.

It will handle economically all grades of bituminous fuels and is practically smokeless under normal operating conditions.

It is capable of handling variable loads and heavy overloads efficiently and with minimum attention.

The cost of maintenance is low, averaging about 10c. per horsepower per year.



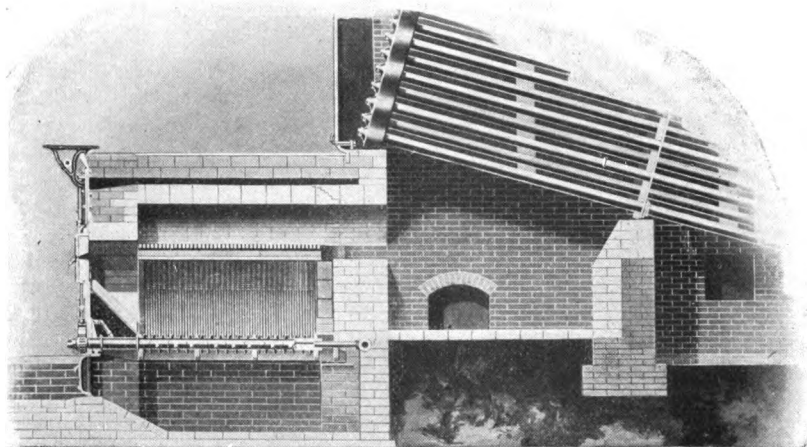
**The Murphy Automatic Smokeless Furnace  
REAR VIEW**

It operates with natural draft, the cost of actuation approximates  $\frac{3}{4}$  of 1 per cent of total steam generated.

Its usefulness is not limited to steam making, it will give excellent results in all operations where high temperatures are required, such as brick drying, cement burning, salt evaporation, calcining of soda ash, heating furnaces, etc.



## MURPHY IRON WORKS



**Murphy Furnace—Dutch Oven Setting**

At either side of the furnace extending from front to rear is the coal magazine into which the coal may be introduced either by hand or mechanically. At the bottom of this magazine is the coking plate against which the inclined grates rest at their upper ends. The stoker boxes, operated by segment gear shafts and racks, push the coal over the coking plate and on to the grates. The grates are made in pairs, one fixed and the other movable. The stationary grates, at their lower ends, rest on the grate bearer, which also acts as a support for the clinker grinder. The clinker grinder consists of a square steel shaft, on to which is slipped small cast iron toothed segments, which are readily replaced in case of breakage.

Just over the coking plate is the arch plate, from which a fire brick arch is sprung over the entire furnace. Upon this arch plate are cast numerous ribs to form a series of air ducts immediately over the coking plate, conveying the heated air from the chamber above the arch into the combustion chamber. This arch plate also forms the wall of the magazine. The furnace, or battery of furnaces, can be operated by a small automatic engine, motor or by overhead shaft and ratchet drive, as may be desired. Arrangement is made for exhaust steam connections at the lower end of the grates for the protection of this portion of the grates and clinker grinders and for the softening of the clinker. In connection with horizontal tubular boilers or water tube boilers horizontally baffled, the Murphy furnace can be installed with a flush front setting. Arrangement can be made for extended or Dutch oven settings, should this be desired.

## LACLEDE-CHRISTY CLAY PRODUCTS COMPANY

CHAIN GRATE STOKER DEPARTMENT  
ST. LOUIS, MISSOURI

### "LACLEDE-CHRISTY" CHAIN GRATE STOKERS

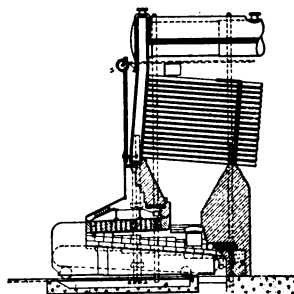
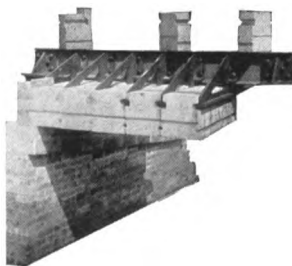


There is a striking individuality in the "Laclede-Christy" Chain Grate Stoker springing from its distinctive features. These are carried uniformly throughout the entire range of standard sizes from the smallest to those of unusually heavy pattern built for the largest of boiler units

and designed for the extreme high capacities now required by modern power plant operation. Mechanically, these stokers are all that ingenuity of design, carefulness in the selection of material and watchfulness in construction can make them.

Second in importance to the mechanically perfect stoker is the arrangement and construction of the stoker's setting and surrounding brick work which forms the furnace space. Such matters as low maintenance cost, smokelessness, economy and high rates of burning are more essentially matters of the design and construction of the furnace, which feature receives our special attention.

We are the only stoker builders that control the manufacture of the refractory materials entering into the furnace construction. We manufacture all refractory material required in boiler and furnace settings, such as flame plates or baffle tile, boiler tube tile, special bridge wall tile, furnace blocks, and all types of ignition arch tile.



Stoker Applied to Water Tube Boiler

"Laclede-Christy" Patented Flat Suspended Arches are built in all sizes and are used extensively for ignition arches for all types of chain grate stokers, Stirling boiler arches, crowns of industrial furnaces, and all cases where service and conditions are such that radial arches are difficult to maintain. These patented arches are built of our very highest grades of refractory material and the heavy, rigid construction of the self contained supporting structure furnishes an unusually durable construction.

# ROSEDALE FOUNDRY & MACHINE CO.

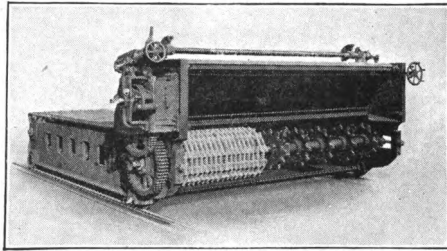
ESTABLISHED 1871

PITTSBURGH, PA.

ENGINEERS, FOUNDERS &amp; MACHINISTS

## PLAYFORD TYPE B CHAIN GRATE STOKER

The PLAYFORD TYPE B STOKER has been designed to fulfill the requirements for a chain grate stoker to operate under continuous heavy duty and exacting power plant service; no detail of cost in material or workmanship which would in any particular add to the strength, rigidity or durability of a stoker operating continuously under loads varying from 150 to 225% of boiler rating, has been omitted in its construction. It is designed to operate with any commercial, type or grade of bituminous or semi-bituminous coal.

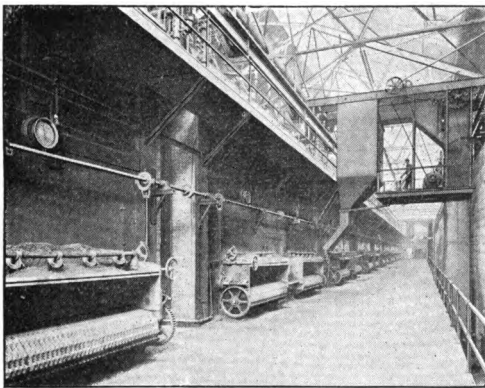


In determining the most desirable type or make of mechanical stoker for a given condition, the essential points for consideration, in varying relative importance for different conditions are as follows:—

1. High efficiency. 2. Capacity to quickly develop and to continuously maintain overloads of from 150 to 225% of boiler rating without hand stoking, smokelessly, and without forced draft apparatus. 3. Minimum amount of labor for operation, and minimum attention from the operatives. 4. Low cost of maintenance, which should not exceed five to seven cents per H.P. per annum for five to nine years of continuous operation. 5. Smokeless combustion using the available bituminous or semi-bituminous coals of lowest cost to the existing plant. Data in detail as to the fulfillment of these standard requirements by Playford Stokers is available and will be submitted upon request.

### Important Features of the Type B Playford Stoker

1. Positive spur gear drive, gears covered and protected.
2. Gears may be removed and reversed when teeth are worn, placing opposite face of teeth in contact, thus obtaining double service.
3. Grate bar links can be replaced without removal of the supporting rods.
4. Adjustment of chain tension at front and rear, permitting adjustment at any time while stoker is in operation.
5. Lubrication of front and rear main shaft bearings. Bearings of driving mechanism brass bushed.
6. Safety automatic release of drive, preventing damage of machine through an accidental breaking of any part.
7. Patented water cooled fuel gate, preventing back firing in coal hopper.
8. Stoker designed to permit entire rebuilding without removal from the furnace.
9. Heavy center structural steel supports and braces for stokers over 8' in width, also heavy steel I beam transverse bracing.
10. Extra heavy design of side frames, 4" diameter driving shafts, all other parts of special heavy design.
11. Ventilated and air cooled ignition arch of special fire brick shapes of the highest quality of refractory material obtainable which can be easily replaced.
12. Either fixed or movable water cooled back at bridge wall, the latter preventing all leakage of air over fire at this point, and acting as a retarding member to the fuel bed upon the grate, as well as permitting the dumping of large clinker into the ash pit.



24-400 H.P. Boilers, 9600 H.P. Equipped with Playford Stokers; Operated by Three Firemen, One Water Tender, and One Boy on Coal Conveyor.

of Playford Stokers to any standard type of water tube boiler, with drawings in detail of some of the most modern steam plants in this country, will be forwarded upon request.

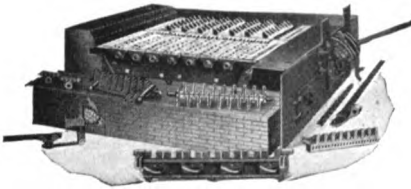
*Descriptive literature, copies of tests and drawings showing the application*

# MARION MACHINE, FOUNDRY & SUPPLY CO.

Office and Factory, P. O. Box 297  
 TULSA, OKLA. MARION, IND., U. S. A. NOWATA, OKLA.  
 CHICAGO, ILL., U. S. A.

**MANUFACTURERS OF POWER PLANT EQUIPMENT: BOILER GRATES, ALEXANDER PATENT WATER GAUGE, MARION ROTARY SOOT BLOWER BOILER FRONTS, CASTINGS, ETC.**

## THE "SHEAR-KLEAN" GRATE



Showing Grates Assembled—Also Parts

has a very effective "sidewise" action. This abrasive "sidewise shearing" and "crushing" action effectually removes the non-combustible and clinker-forming material from beneath the fire bed without destroying the efficiency of the live coal fire above. The "sidewise" action makes it a most efficient grate.

This result cannot be accomplished by means of the ordinary rocking motion alone, but can only be secured by the combination of the rocking motion and the "sidewise" shearing and crushing action. Of the two actions, the latter is the more effective and can only be secured in "SHEAR-KLEAN."

The "SHEAR-KLEAN" is not a dumping grate. It never fails to clean, consequently dumping is unnecessary. The working principle of the SHEAR-KLEAN GRATE is such that the fireman can handle and control his fires *without the use of slicebar or poker.*

The positive CENTERING DEVICE makes it impossible for the fireman to get the shaking lever out of the socket in the shaking attachment until the grates are central and level. The points of all fingers are slightly rounded, and when in a central or level position, a hoe can be run over the surface of grates without obstruction.

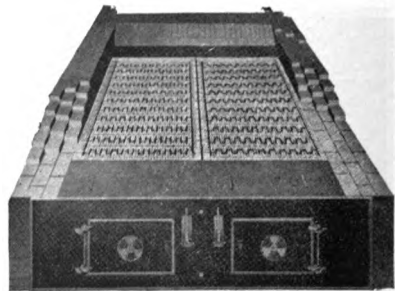
The fingers of the grate bars are of the interlocking type, the type which has been demonstrated to be the most effective, and they are made strong enough to crush anything which could possibly accumulate in a boiler furnace. The *positive, centering device*, only to be found on "SHEAR-KLEAN" and MARION INTERLOCKING GRATES, makes it impossible to burn the fingers of the grate bars.

The "SHEAR-KLEAN" Grate bars are of special shape and so designed as to give the proper air space, according to the size of grate and quality of fuel burned. Comparative tests of the grate with other styles show a great difference in the brightness and clearness of the fire.

In the "Marion Line" of boiler grates the bearing bar proper is entirely below the heat zone. The clip journals are only removable by an *upward* pull. It is not possible to lift the clip journal out of position when grates are actuated.

The "SHEAR-KLEAN" Grate is especially designed to meet the demand for a really efficient grate, one which will burn the cheapest grades of clinkering coals efficiently and economically and *keep the fire clean at all times.*

In addition to the fore and aft "shaking motion," which is all that can be secured with any other type of grate, the "SHEAR-KLEAN"



Shear-Klean Grate in Position

# McCLAVE-BROOKS COMPANY

MAIN OFFICE AND WORKS, SCRANTON, PA.

NEW YORK OFFICE  
50 Church St.

CHICAGO OFFICE  
708 Fisher Bldg.

**MANUFACTURERS OF McCLAVE'S STOKER, McCLAVE'S SHAKING, CUT-OFF AND DUMPING GRATES, McCLAVE'S ARGAND STEAM BLOWER. ALL KINDS OF IRON AND BRASS CASTINGS**

## McCLAVE'S SHAKING, CUT-OFF AND DUMPING GRATES

Made in four different types: Nos. 1 and 2 being used principally for soft coal and the larger sizes of anthracite: Nos. 3 and 4-A for the smaller anthracite sizes.

**McClave Grate No. 1** is our old type of Shaking and Cut-off Grate, in which all of the grate bars are cast integral. In our new type, **No. 2**, the regular grate bars are made with *Removable Sectional Tops*, with shanks which are mounted in sockets in the pendant body portion of the bars. Cost of repairs is thus reduced to a minimum. These grates have an absolute cut-off movement, in which each row or section can be operated as a whole, or the front and rear separately. In the shaking movement there is no increase in the openings between bars, consequently no waste of unconsumed fuel.

**McClave Grate No. 3.** Specially adapted to burn the smaller sizes of Anthracite fuel, such as Buckwheat, Birdseye, Rice, etc.

The Grate Bars are constructed with a body portion and *Removable Sectional Tops*, the shanks on the tops being arranged centrally, which makes practically a "T" formation, whereby a double cut-off movement is secured by forming pockets on either side of the bars. Each row can be operated as a whole, or the front and rear separately.

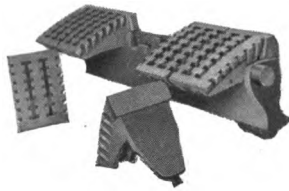
**McClave Grate No. 4-A.** This a dumping grate, specially designed to burn the smaller sizes of Anthracite Coal. Sectional Removable Tops are made with beveled edges at end, to allow for expansion. Overlapping of edges of bars prevents sifting between the bars. Fitted with twin levers for operating the front and rear series of bars separately.

The mesh or air space in the tops is made as small as  $\frac{1}{8}$ " for the very small sizes. The construction as a whole is very strong and durable.

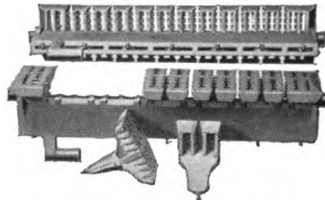
Grate frames are made in one or more rows, as required, with expansion top Journal Bearing Bars reaching from the front to rear of furnace, and having Journal Locks which fit over the journals of the Grate Bars, to prevent the bars from lifting out of their bearings when they are being operated.

## McCLAVE'S ARGAND BLOWER

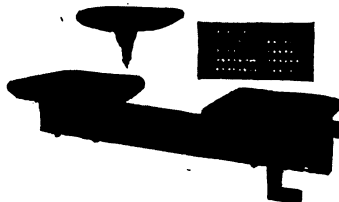
The result of over thirty years' experience with the problem of more effectually burning the cheaper grades of Anthracite and Bituminous fuels. Gives a properly proportioned combined air and steam blast, and forms a complete system when used in connection with McClave Grates. Large volume of air with small steam consumption guaranteed. Practically noiseless in operation, Automatic Blower Regulator also furnished when desired. Illustration shows new type High Duty Blower installed through side wall of boiler.



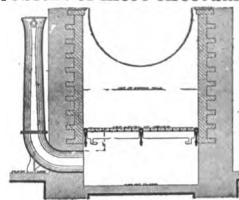
McClave Grate No. 2



McClave Grate No. 3



McClave Grate No. 4-A



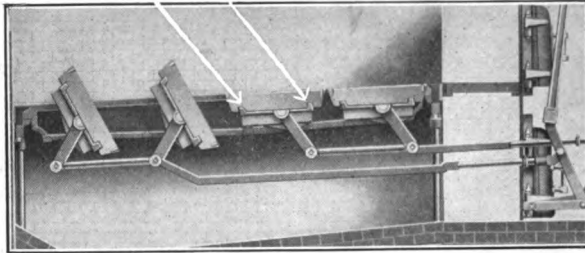
## WASHBURN & GRANGER

50 CHURCH STREET, NEW YORK

**THE DEAN DUMPING GRATE; DEAN SHAKING GRATE; COMBINATION SHAKING AND DUMPING GRATES OR STATIONARY GRATES.**

### THE DEAN DUMPING GRATE

The illustration shows a twelve-cradle grate for a furnace 10' 4" wide by 7' 0" deep. The rear grates are tipped for dumping. To clean the front half of the grate the live coals are first moved to the rear bars. Tipping cradles to angle of 65 degrees frees the grate instantly of ash and clinker. The bars are then returned to normal position and all the live coals pulled forward to permit the rear grates to be dumped and cleaned, after which the fire is spread and covered.

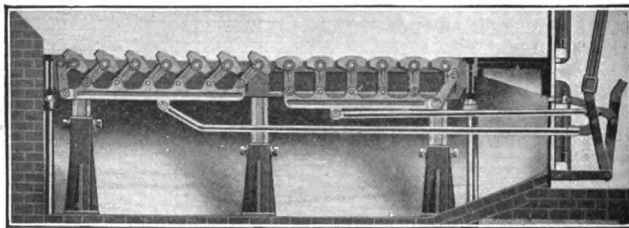


This type of grate is particularly adapted to deep furnaces and fire-boxes of water-tube boilers in which the bridge walls are built up to the tubes.

The grates rest in cradles, are free to expand and contract and are readily removable. The cradles offer a two-point bearing for the bar which prevents them from warping as occurs in bars supported only at the middle. The cradles are dumped in tandem by levers operated at the front of the boiler.

### THE DEAN SHAKING GRATE

The illustration below shows a six-section shaking grate, built three sections wide for bituminous coal. This view shows adjustable legs by which the grate may be raised or lowered at the bridge wall or adjusted at any time to accommodate an increased thickness of fire. This is impossible where grates are built



into the brick work. The type shown also has the advantage of freedom for expansion and contraction.

The entire grate surface moves when operated, even to the end bars. This enables the fire to be cleaned from bridge wall to dead plate solely by the movement of the grates.

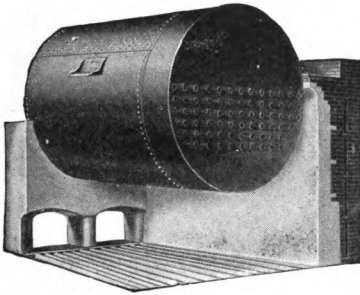
### COMBINATION SHAKING AND DUMPING GRATES OR STATIONARY GRATES

We manufacture grates for all sizes of furnace and in any combination for all grades and sizes of coal. Standard grate bars, boiler fronts and firing tools furnished promptly.

## BETSON PLASTIC FIRE BRICK CO.

P. O. Box 7312, ROME, NEW YORK

MANUFACTURERS OF "BETSON'S PLASTIC FIRE BRICK"



Sectional View of a Betson Fire Box, Lined All Around in One Block

A solid, One-Piece Boiler Door Arch, or a Whole Furnace Lining, in one block, without joints, is a possibility, made practicable solely by

### BETSON'S PLASTIC FIRE BRICK

This Product, invented and developed by the late Lester E. Betson, is an original combination of the best refractories. The most important feature being that in this Compound alone Expansion and Contraction is neutralized, so that in practical service this Product *does not expand or contract*

For this reason large blocks or whole linings formed of this material are not affected or cracked by high heats or

sudden changes of temperature—due to the opening of doors, &c.

A Boiler Setting lined continuously and throughout with Betson's Plastic will be Gas and Air Tight. Authoritative tests show fuel losses up to 25% from cold air leaks in old settings. Being formed right in place, these linings fit perfectly and fill all cracks and crevices.

Betson's Plastic Fire Brick is a thoroughly practical, high-grade article, prepared particularly for hard boiler service, to stand high heats, fluctuations of temperature, and the wear and tear.

This product has been used for many years in large plants, so that it has been well tried out and is not new.

**BETSON'S PLASTIC FIRE BRICK** is shipped in Bulk, in Barrels, in a moist Plastic condition, Ready to Use.

It only requires to be well pounded into the place desired, and as it comes quite stiff it will remain as placed and finished off, so that except for a simple support temporarily placed in a door opening or under an arch.

**NO MOULDS OR FORMS ARE REQUIRED**

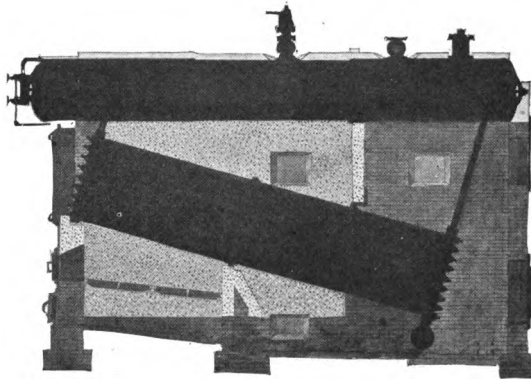
As soon as installed, these linings are set, in a few hours' time, with a slow fire. The material will quickly become very hard and the linings may then be put into immediate use.



Betson's Plastic Fire Brick weighs, in its plastic state, 120 pounds per cubic foot. The Barrels contain 500 to 700 pounds each.

Estimates given from Blue Prints.

This product remains in moist, workable condition for one to two months, and any surplus which in time becomes too dry, can be restored by working a little water into it.



Betson One-Piece Linings are giving the same good satisfaction in WATER TUBE BOILER SETTINGS as in Fire Tube Boiler settings.

## MONARCH BOILER ARCH COMPANY

631 WELLS BLDG., MILWAUKEE, WIS.

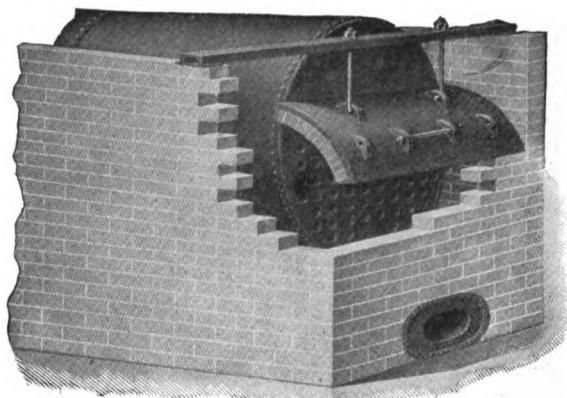
**MANUFACTURERS OF REAR COMBUSTION CHAMBER AND FIRE DOOR ARCHES FOR RETURN TUBULAR AND INTERNALLY FIRED BOILERS.**

### MONARCH PATENTED BOILER ARCHES

**For Fire Doors and Rear Combustion Chamber Arches of Tubular and Internally Fired Boilers**

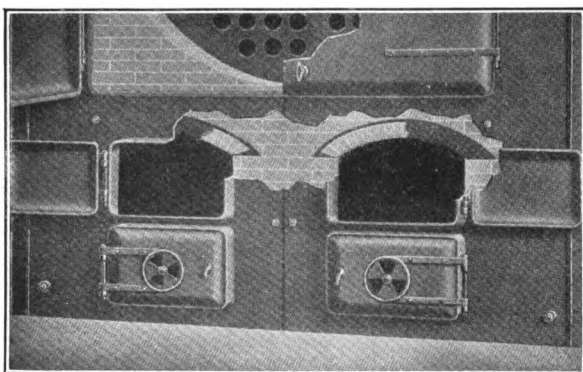
#### SOLVE THE BOILER SETTING PROBLEM

They are absolutely different from anything on the market, easily installed and *guaranteed for five years.*



**Rear Combustion Chamber Arch**

We use only best grade of fire brick and there is no binder between them to burn out. The brick are held in place by the metal which is shrunk around them and consequently they cannot fall out. There is no metal exposed to the heat, and they are absolutely air tight. No more annoying delays and expensive repairs due to faulty arches. They have been used in representative power plants throughout the country for the past ten years.



**Fire Door Arch**

Full information, list of satisfied users and free booklet entitled "HORIZONTAL TUBULAR BOILER SETTING," sent on request.



**H. BLOOMSBURG & CO.**

425 N. CAREY ST., BALTIMORE, MD.

**CIRCULATORS; STEAM JETS FOR STEAM BOILERS****THE EQUILIBRIUM CIRCULATOR AND STEAM HEATING ATTACHMENT****For Heating and Circulating the Water in Steam Boilers  
NEARLY 600 APPARATUS INSTALLED**

Equalizes the temperature of all parts of the boiler, thus preventing the unequal expansion and contraction, with consequent leaks of seams and rivets, due to such straining.

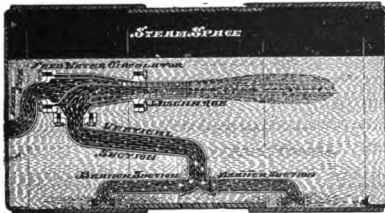
Increases Steaming Capacity 5 to 15 per cent. on same fuel consumption or the same power on a corresponding reduction in fuel.

Saves cost of repairs and prolongs life of boiler.

Prevents the deposit of mud and sediment, and the formation of scale. Prevents or reduces foaming (or priming) and pitting.

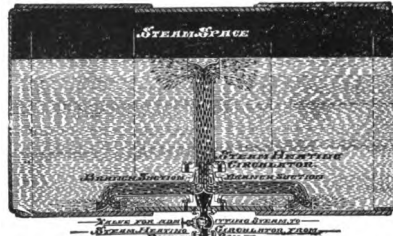
By using steam from another boiler, while starting fires, steam may be raised from cold water in an hour, without straining boiler.

We guarantee satisfactory results when properly installed.

**ACTION OF APPARATUS**

**Section of Feed Water Circulator and Pipes  
on Larger Scale than Boiler**

The action of the apparatus is as follows: **FEED WATER**, on being admitted to the boiler, discharges through **FEED WATER CIRCULATOR** and **DISCHARGE NOZZLE** as shown by arrows, this causes an induced current of water to flow up the **VERTICAL SUCTION** pipe and out through **DISCHARGE** nozzle mixing with the feed water as it discharges into boiler. **WATER FROM BOTTOM OF BOILER** now enters inlet tees and passing through **BRANCH SUCTION PIPES** enters the **VERTICAL SUCTION PIPE**, to supply the current flowing up it as shown by arrows. This action removes all the colder water from bottom of boiler and discharges it at the surface after it has become heated in its passage through the **VERTICAL SUCTION PIPES** by the hot water surrounding, then mixing with feed water raises its temperature before it is discharged into boiler. As the cold water is carried to the surface the hot water settles down to replace it, thus creating a rapid movement of the water in all parts of the boiler.



**Section of Steam Heating Circulator and Pipes  
on Larger Scale than Boiler**

The operation of this apparatus is as follows when getting up steam from cold water: While starting fires, steam is admitted to **STEAM HEATING CIRCULATOR** from Donkey boiler (or another boiler). This steam discharges through **STEAM HEATING CIRCULATOR**, as shown by arrows, up the vertical discharge pipe, heating the water in this pipe to a high temperature and causing an induced current to flow upward and discharge through the distributing tee at the surface. Cold water then enters from bottom of boiler through the inlet tees and passing through **BRANCH SUCTION PIPES** and **STEAM HEATING CIRCULATOR**, passes up the vertical discharge pipe, is heated in contact with the steam and discharges at surface as shown by arrows. This action continues until all the cold water in bottom of boiler has been carried to the surface and heated and the hot water has settled down to replace it. Thus all the water becomes heated to an even temperature ready for making steam in about an hour. Steam heating circulator may be combined with feed water circulator.

**SPECIFICATIONS**

| Size of Feed and Suction Pipes | Horse Power of Stationary Boilers at 30 lbs. of Water per H. P. | Price of Feed Water Circulator | Price Steam Heating | Price Total | Size Branch Suction Pipes | Size of Tees on Branch Suction Pipes |
|--------------------------------|---|--------------------------------|---------------------|-------------|---------------------------|--------------------------------------|
| 1 1/4 inch                     | 55 to 110 H.P.  | \$30.00                        | .....               | .....       | 1 inch                    | 1/2" x 1/2" x 1"                     |
| 1 1/2 "                        | 80 " 160 "  | 40.00                          | .....               | .....       | 1 1/4 "                   | 3/4" x 1/2" x 1 1/4"                 |
| 2 "                            | 140 " 280 "   | 50.00                          | \$40.00             | \$90.00     | 1 1/2 "                   | 1" x 1" x 1 1/2"                     |
| 2 1/4 "                        | 220 " 440 "   | 60.00                          | 50.00               | 110.00      | 2 "                       | 1 1/4" x 1 1/4" x 2"                 |
| 3 "                            | 320 " 640 "   | 70.00                          | 60.00               | 130.00      | 2 1/2 "                   | 1 1/2" x 1 1/2" x 2 1/2"             |

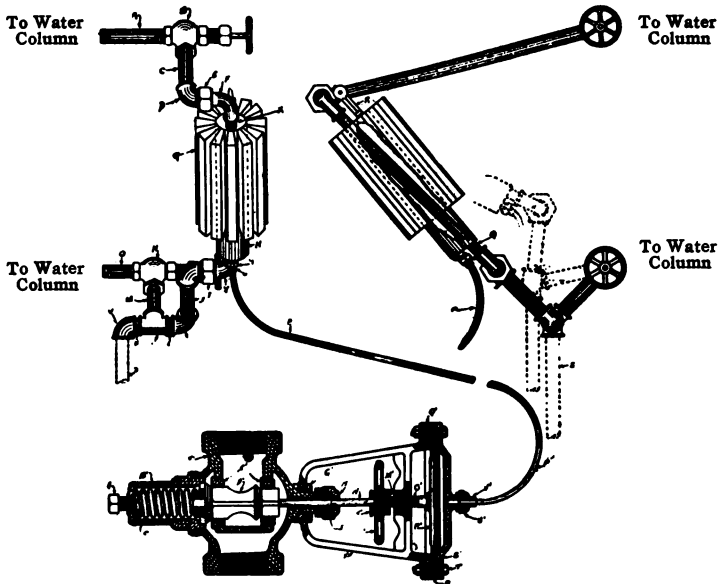
The above prices are for the Machines only and do not include Piping, Fittings or Erection.  
Send for Catalogue if interested.

## THE "S-C" REGULATOR COMPANY

FOSTORIA, OHIO

MANUFACTURERS OF THE "S-C" WATER LEVEL REGULATOR, THE  
"S-C" PUMP GOVERNOR

### THE "S-C" VERTICAL FEED WATER REGULATOR



Regulator with Two Views of the Generator as Connected  
to an Ordinary Water Column

#### Ten Distinctive Features

1. Continuous Feed.
2. Constant level on steady load.
3. Carries higher level (stores heat) on light load.
4. Carries lower level (makes stored heat available) on peak load.
5. Extreme variation adjustable from 2 inches to 8 inches.
6. But one moving part—the valve stem.
7. Valve seats are monel metal or nickel bronze and are renewable.
8. Means are provided for hand operation.
9. Will control boiler with banked fires.
10. Entirely free from and independent of all floats, whistles, alarms, exhaust ports and other objectionable and unreliable features. Fully guaranteed.

**Easy to Install.**—No water column or structural iron frames to erect, no rearrangement of feed lines, valve can be installed in any position at any point in feed line.

**Special Safety Feature.**—When boiler tubes burst means are provided for immediately stopping flow of water to boiler, thereby keeping pump from racing and wrecking itself, also assuring operator that normal water pressure will be kept in feed lines and other boilers in natural operation while operators are barred from entering room on account of steam and hot water.

For further description and price, address above.

# RICHARDSON SCALE COMPANY

PASSAIC, N. J.

BRANCH OFFICES:

|             |                    |                |                |                     |
|-------------|--------------------|----------------|----------------|---------------------|
| NEW YORK    | CHICAGO, ILL.      | WICHITA, KANS. | BUFFALO, N. Y. | SAN FRANCISCO, CAL. |
| OMAHA, NEB. | MINNEAPOLIS, MINN. | BOSTON, MASS.  | ATLANTA, GA.   |                     |

## BUILDERS OF AUTOMATIC WEIGHING MACHINERY

*Do You Know What it Costs You to Evaporate Every Thousand Pounds of Water?*

And are you sure that cost could not be reduced?

*Do you know to the last pound what each boiler consumes each shift?*

Are you sure you *do not use too many boilers* through fuel wastes?

You know *some boilers consume far too much coal* for the power generated.

Do you realize that in order to stop the smoke nuisance by admission of air, you may admit too much for efficient combustion, and so use too many boilers and *too much coal to maintain steam?*

Do you know *what you lose through air leaks?*

If you do not *maintain 100% efficiency* let the

## RICHARDSON AUTOMATIC COAL SCALES

tell you the *weight of coal fed to your boilers* and at the same time detect any fluctuations.

If you buy coal by analysis, you realize the importance of determining scientifically the quality of your coal; therefore you will also quickly *realize the importance of accurately weighing your coal to the last pound* for each boiler and each shift. You can save as much money by *reducing the quantity of coal* consumed as by getting the maximum number of heat units per hundred pounds.

Richardson Automatic Scales are built on the *equal balance principle* and are fitted with *standard weights*. The scale is *self-testing*.

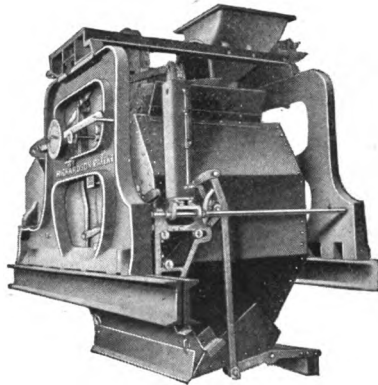
The lower part of the hopper of the smaller scales is made entirely of non-corrosive metal, while that of the larger type scales is lined with it, so that neither the moisture in the coal nor the fumes arising from coal consumption can eat it away; nor can the coal stick in the hopper.

The simple operating *levers work on brass pins*; so they do not stick nor stop through corrosion.

The framework, chute, etc., are made of heavy cast iron.

An interlock between the feed gate and discharge door is provided to prevent the one being opened through accident or design, simultaneously with the other. This prevents the firemen getting more coal than is charged against them.

The scales are made in any size from 100 to 3000 lbs. per discharge; thus quantities of from one ton to two hundred tons can be handled hourly.



Gravity Operated Coal Scale

# THE VULCAN SOOT CLEANER CO.

MAIN OFFICE AND FACTORY, DUBOIS, PA.

SALES DEPARTMENT  
G. L. SIMONDS & COMPANY  
230 So. La Salle St., CHICAGO, ILL.

NEW ENGLAND REPRESENTATION  
JAMES MOORE COMPANY  
5 City Square, CHARLESTOWN, MASS.

Agencies in all Principal Cities

## MANUFACTURERS AND INSTALLERS OF THE VULCAN SOOT CLEANER

### THE VULCAN SOOT CLEANER

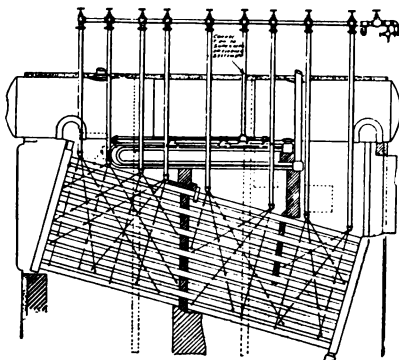
Is designed in various forms to fit every type of boiler, water tube and return tubular, horizontal or vertical. It removes soot and ash from tubes and drums, from superheaters, from combustion chambers, from economizers and from smoke ducts. The claims made for the Vulcan Soot Cleaner as a soot remover do not apply to the clinker or slag formations, such as sometimes form in the first pass of water tube boilers on the tubes next to the fire.

The principle of the Vulcan is perfect *distribution* of the steam, so directed and controlled as to clean the entire surface of every tube.

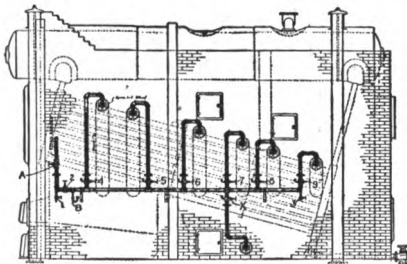
#### As Applied to Water Tube Boilers

The Vulcan Cleaner consists essentially of long blow pipes carried across the full width of the boiler. These pipes, which are absolutely essential to complete soot removal, may be either stationary or revolving, and may have perforations at proper intervals, or be equipped with special nozzles. The design and location of these pipes depend upon many factors, such as size and type of boiler, arrangement of baffling, steam pressure, gas temperature, etc.

We employ three distinct designs, known as Systems No. 1, No. 2 and No. 3. Quite frequently conditions require that a combination of any two or all three of these designs be used.



System No. 2—Top Installation



System No. 3—Revolving Pipe System

**System No. 1**—This design is used in part or entirely in certain cases. It consists of a stationary system of piping placed between and on top of the tubes and extending across the boiler. These pipes are drilled to throw *two* jets of steam between every two rows of tubes, the jets generally being directed to blow *with the draft*. These pipes and nozzles are connected to 2-inch risers outside the setting.

**System No. 2** is applied only to horizontal water tube boilers, horizontally or vertically baffled. It consists of eight stationary blow pipes carried across the full width of the boiler and supported by the boiler tubes. Four of the blow pipes are placed at the top of the first pass, two at the top of the second pass and two at the top or bottom of the third pass. Each of these pipes is provided with special three-way nozzles so arranged that the jets of steam for the removal of the soot are discharged down or up through the clear diagonal space for gas passage around the tubes. The eight main blow pipes are carried through the side wall of the boiler setting to a steam header.

Consulting Engineers are often confronted with the problem of placing large boiler equipment in very limited space. With hand cleaning,

sufficient alley space between boilers *must* be allowed. With the Vulcan Soot Cleaner the alley space may be reduced to any width or eliminated altogether and the boilers set in a solid battery. In such cases the Vulcan Soot Cleaner is installed and operated from the top, as shown.

## THE VULCAN SOOT CLEANER CO.

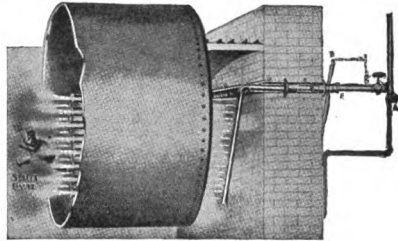
### THE VULCAN SOOT CLEANER (Cont'd.)

**System No. 3** is similar to System No. 2 except that single, instead of triple steam jet is used, and the entering blow pipes rotate instead of remaining stationary. As the blowing range of revolving pipes is so very extensive, only six such pipes are required on the above type of boiler. These blow pipes contain special nozzles which discharge blasts of steam diagonally between the tubes. These rotating pipes are also very effective in cleaning soot from the drums and headers.

System No. 3 is used not only on horizontal water tube boilers, but on all Stirling type of boilers where baffling is standard or will permit. In Stirling boilers where baffling is special or out of the ordinary, System No. 3 is often effectively used in combination with System No. 1.

#### For Return Tubular Boilers

The Vulcan consists of a movable blow pipe containing many nozzles, so spaced as to make it impossible to miss a tube. This blow pipe swings in a half circle across the entire tube area, and discharges jets of *dry* steam directly into every tube, always blowing with the draft. Permits frequent cleaning.



Applied to Return Tubular Boiler

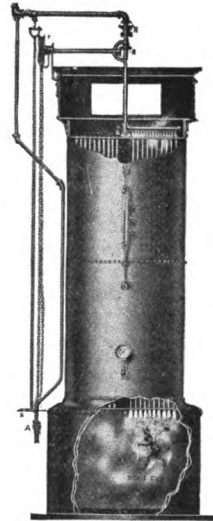
The blow pipe is completely protected from the heat and will not burn out. When not in use, the blow pipe is drawn back into a recess in the wall, entirely out of the gas currents, where no burning heat can reach. A heavy cast-iron lintel is furnished to support brick work above recess.

#### As Applied to the Manning Type

The Vulcan blows from a horizontal blow arm, fitted with a series of nozzles, and blows the tubes in rows in radial lines. The arm, turned by beveled gear, revolves on a pivot bearing placed at the center of the top tube sheet. Thus dry steam shoots downward *directly* into the tubes and *close* to the tubes.

The Cleaner can be used at any time, and the whole operation is done by the turn of an extension rod that opens the controlling valve overhead, and by the turning of a chain and sprocket. Can be furnished to operate by hand from the top of the boiler, if preferred.

**WILL NOT BURN OUT.**—There are *four* reasons why the blow pipes of the Vulcan cannot be damaged by heat: 1st. The only pipes that could ever be affected are at the top of the first pass, but the Vulcan keeps this pass so clean that the temperatures at this part of the boiler, even with exceptionally high furnace temperatures, will never be more than 900 degrees F. to 950 degrees F., and iron pipe will stand much higher temperatures than these for an almost unlimited period. 2nd. The blow pipes are cooled, to some extent, by their contact with the tubes filled with relatively cooler water. 3rd. All material used is extra heavy and of the best quality. 4th. With our experience we know where to place the pipes and where not to.



Manning Type

Our book "Economical Steam Production" gives full details of the VULCAN SOOT CLEANER as applied to all types of boilers. It is an interesting book especially written for Mechanical and Operating Engineers. We will send a complimentary copy upon request.

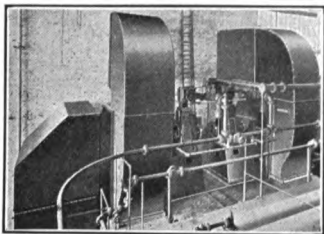
## B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON, MASS.

Offices in all principal Cities

**MECHANICAL DRAFT, FUEL ECONOMIZERS, STEAM TURBINES, STEAM ENGINES, GASOLINE ENGINES, GASOLINE ENGINE GENERATING SETS, MOTORS, GENERATORS, STEAM TRAPS, HEATING AND VENTILATING SYSTEMS, FANS, BLOWERS, EXHAUSTERS, ETC.**

### MECHANICAL DRAFT



Draft produced by a fan is called mechanical draft, and may be forced or induced as conditions demand. Its cost is from 20 to 40 per cent of that of a chimney. Its intensity permits of the burning of finely divided or low grade fuel. It makes possible the utilization of the flue gases which a chimney wastes in producing draft, it is independent of the weather, decreases smoke, increases the capacity of an existing plant, and serves as an auxiliary to a chimney already overburdened. It saves space and is portable.

### FUEL ECONOMIZERS

The Sturtevant Economizer effects:

A saving of 10 to 20 per cent in fuel,  
An increase of 20 to 40 per cent in boiler capacity,  
An appreciable extension of the life of a boiler,  
A purification of the feed water,  
A reduction in expense of repairs,  
The deposit of large amounts of soot.

In the Sturtevant Economizer the pipes are arranged "staggered" instead of in straight rows, thereby giving the pipes a better opportunity to absorb heat from the gases. These economizers are made with taper metal-to-metal joints that require no packing, cement or rusting. The placing of the pipes of one row opposite the spaces of the adjacent sections increases the effective area of the transmitting surfaces and thoroughly breaks up the currents of hot gases by directing them between the pipes and against those standing in their paths.



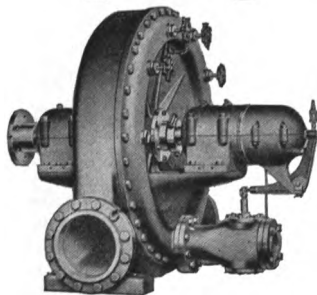
### STEAM TURBINES

The Sturtevant Steam Turbine is of the multi-velocity type, and its operation is such as to give high efficiency, and permit of moderate rotative speeds without gears. Hand valves are used for shutting off the nozzles, and the speed is regulated by a centrifugal throttling governor placed on the end of the shaft.

No special foundations are required and the turbine can be placed on an ordinary floor. Internal lubrication is unnecessary, therefore the exhaust steam is free from oil.

5 regular sizes from 5 to 250 H.P.

Approximate speed from 4000 to 1000 R.P.M.



### STEAM ENGINES

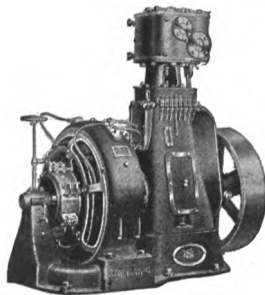
(Automatic High Speed)

Vertical Single Cylinder from 5 to 87 H.P.

Vertical Compound from 35 to 171 H.P.

Horizontal Center Crank Engine from 39 to 225 H.P.

Sturtevant Engines are adapted to continuous operation for long periods without attention. Gravity lubrication and complete enclosure of moving parts insure cleanliness and high mechanical efficiency. Rites Governor gives 1½ per cent speed variation only.



### MOTORS, GENERATORS AND GENERATOR SETS

Direct Current Apparatus for any Standard Voltage

|   |     |    |           |
|---|-----|----|-----------|
| Bi-Pole Motors (enclosed and semi-enclosed type)..... | 1/4 | to | 3 H. P.   |
| Four-Pole Motors.....                                 | 2   | to | 30 H. P.  |
| Eight-Pole Motors.....                                | 1   | to | 225 H. P. |
| Six-Pole Generators.....                              | 5   | to | 17½ K. W. |
| Eight-Pole Generators.....                            | 20  | to | 150 K. W. |
| Turbine Generating Sets.....                          | 3   | to | 50 K. W.  |
| Steam-Engine Generating Sets.....                     | 5   | to | 150 K. W. |

## B. F. STURTEVANT COMPANY

### STEAM TRAPS

This steam trap, made for different pressures, is designed for steam heaters or radiators of any construction. Both extension and cone are of brass ground to a fit. The pot is readily removed for cleaning by loosening up the bolts.

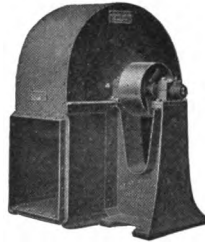
### PROPELLER FANS

Propeller fans are designed for use against low pressures, and are applicable for ventilation and exhaust work in boiler and engine rooms, kitchens, clubrooms, smoking rooms, offices, stores and similar places. They are constructed with a frame of cast iron, that is fastened into the wall of the building and are driven by either belt or direct-connected electric motors that are enclosed and dust-proof. The construction of these propeller fans is exceptionally strong and durable. Propeller fans are made in sizes of from 18 to 120 inches in diameter.



### MULTIVANE FANS

Multivane blowers and exhausters driven by direct-connected Sturtevant motors, turbines, and engines form the most satisfactory and efficient fan sets on the market. The blast wheel or runner for this fan is composed of shallow floats, which permit the use of very large inlets while maintaining the necessary blade area. The large inlet allows the air to enter with the least loss in friction.



Each blade or float is spooned to distribute equally the pressure within the casing and to add rigidity and strength to the wheel.

### STEEL PLATE FANS

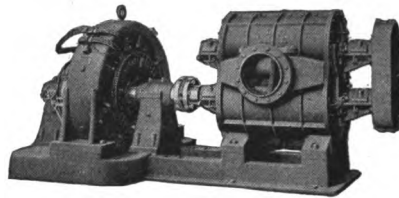
Sturtevant steel plate fans are designed for all sorts of blower and exhauster work. They are the result of fifty years' experience in blower design, are especially strong and durable and are suitable for direct-connected steam engine and electric motor drive and for belt drive. Steel plate fans are built for ventilation and mechanical draft installations, and for planing mill and other exhauster work.

### BLOWERS AND EXHAUSTERS

The Sturtevant High Pressure Blower is made in two types; in the smaller sizes the idler is directly above the impeller, and the shafts lie in a vertical plane. In the larger sizes, the shafts are in a horizontal plane, the intake and discharge being at the bottom and top.

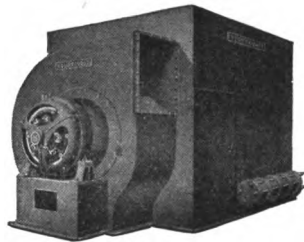
High Pressure Blowers are designed to deliver air at pressures up to five pounds. They are especially adapted to furnishing blast for cupolas, gas and oil burners, annealing and smelting furnaces, cement kilns, and for all sorts of blower or exhauster work demanding high pressures. Special stuffing-boxes to prevent leakage are furnished when these blowers are used to handle gases.

The B. F. Sturtevant Company makes complete installations, including direct-connected, belted, or geared engine or motor, exhauster, automatic regulator, blast gates, by-pass connections, and valves.



### STURTEVANT HEATERS

The Sturtevant fan system of heating and ventilating is economical and positive, heated air providing ventilation as well as heat. Indirect hot blast coils are built of one inch extra heavy steel pipe screwed into cast iron sectional heater bases. Entire heater is enclosed in steel plate casing. Heater is applicable to use of either live or exhaust steam or hot water. System can be used for heating and ventilating any sort of building. The operation is independent of the weather or of atmospheric conditions. By the use of the Sturtevant air washer, the air may be washed at all times, and cooled in summer. Hot air from the heater is forced by a fan through ducts into the building to be heated, and is allowed to escape through vent flues. Fans are driven by steam engine, motor or belt. The steam engine exhaust is used in the heater, thus eliminating the expense of running the engine. Temperature of air entering each room may be closely regulated by thermostatic control.



# AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN

**MANUFACTURERS OF HEATING, VENTILATING, COOLING, PURIFYING, HUMIDIFYING, DRYING, MECHANICAL DRAFT AND BLAST EQUIPMENT; VERTICAL SELF-OILING STEAM ENGINES, STEAM TRAPS; FANS AND BLOWERS FOR ALL PURPOSES.**

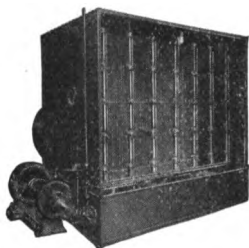


Fig. 1

**"Sirocco"**  
TRADE MARK

## SYSTEM OF PURIFYING, COOLING AND HUMIDIFYING

For Purifying and Humidifying air in Schools, other Public and Semi-Public Buildings.

For Humidifying and Cooling air in Textile Mills, Macaroni Drying Plants, Printing Houses, etc.

For Dehumidifying and Cooling in Candy Factories, Bakeries, Photo Film Drying Rooms, Blast Furnaces, Electric Generators, etc.

Capacities from 3,500 C.F.M. to 350,000 C.F.M.

Write for "detail" information.

Fig. 1 shows "Sirocco" Air Purifier—Cooler—Humidifier and Dehumidifier.

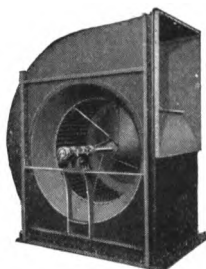


Fig. 2

## MULTI-BLADE FANS AND BLOWERS

For Heating, Ventilating and Cooling in Public, Office, Industrial and Educational Buildings.

For Drying and Mechanical Draft. Sirocco Multi-Blade Fans will handle more air consuming less power than the ordinary steel plate fan, having twice the wheel diameter.

Built with capacities of from 75 C.F.M. to 1,000,000 C.F.M.

Complete specifying information at your request.

Fig. 2 shows "Sirocco" Multi-Blade Fan. Arrangements for Pulley—Motor or Engine drive.

Fig. 3 shows "Sirocco" Multi-Blade Fan wheel.

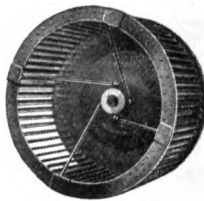


Fig. 3

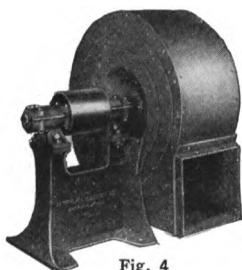


Fig. 4

## TYPE "E" EXHAUST FANS FOR EXHAUSTING AND CONVEYING SYSTEMS

For removing emery dust—saw dust, etc., a regular type "E" wheel is used—same housing, etc. For work in Cooperage and Excelsior Factories—wood pulp mills or other plants where shavings are long and stringy, lint from buffing and polishing wheels etc., a long shavings wheel is used—same housing, etc., special wheels for conveying cotton and wool.

Capacity tables, etc., upon request.

Fig. 4 shows Type "E" Fan pulley drive; built also for motor drive.

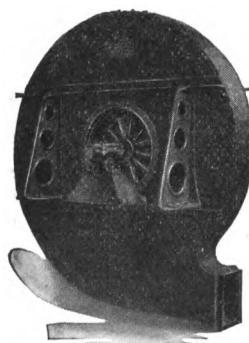


Fig. 5

## TYPE "P" SPECIAL STEEL PRESSURE BLOWERS FOR FURNACE AND CUPOLA SERVICE

For supplying draft to Oil and Gas Furnaces, Cupolas—Sintering—Smelting and Pulverized Coal machines.

For blowing scale from dies in drop forge plants. Bearings being on independent foundations precludes vibration in the housings.

Built with pressures from 1 to 24 ounces.

Ask for complete working data.

Fig. 5 shows Type "P" Special Steel Pressure Blower. Built to discharge at any angle.



# AMERICAN BLOWER COMPANY

## BRANCH OFFICES

NEW YORK, CHICAGO, PHILADELPHIA, PITTSBURG, ROCHESTER, ATLANTA, MINNEAPOLIS, ST. LOUIS, BOSTON, INDIANAPOLIS, KANSAS CITY, SAN FRANCISCO, LOS ANGELES, SEATTLE, with works at TROY, N. Y. and CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO.



### TYPES "A" SINGLE CYLINDER—"E" DOUBLE CYLINDER—"X" COMPOUND-VERTICAL, SELF-OILING STEAM ENGINES

Type "A" Engines develop up to 60 H.P. For School or other work where steam pressure is limited to 30 pounds—advocate Type "A" Low Pressure Engines, develop up to 40 H.P.

Type "E" Engines develop up to 120 H.P. This Engine is advantageous where larger amount of H.P. and high speed is required and only small space available.

Type "X" Engines develop up to 120 H.P. This compound engine is a very conservative steam consumer for H.P. developed. Same space requirements as for Type "E". Complete information on all types at your request.

Fig. 6 shows "ABC" Engine direct-connected to dynamo for generating electric current.

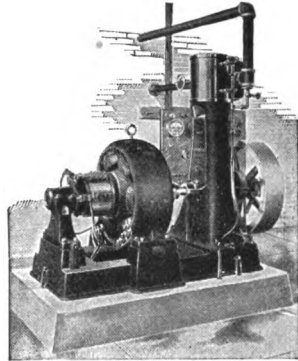


Fig. 6

### "DETROIT" AUTOMATIC STEAM TRAPS. RETURN—SEPARATING—VACUUM AND CONDENSING (TILTING TYPE)

For all steam heated systems or machinery under any pressure.

For automatically returning condensation from whatever source directly to boiler without pumping.

A few applications in which Detroit Traps are successfully used: To drain Lumber—Brick—Laundry—Beet Sugar—Veneer and Paper Dryers—Hot Rolls in Textile Mills—Vacuum systems—Vulcanizing Machinery, etc.

Any condensation handling problem can be economically solved by the use of "Detroit" Traps.

Fig. 7 shows "Detroit" Automatic Return Trap.

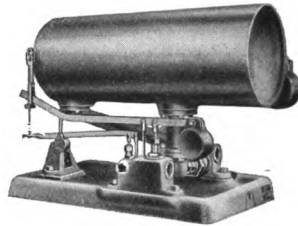


Fig. 7

### TYPE "V" UNIVERSAL BLOWERS AND EXHAUSTERS

Four angles of discharge Right hand drive and four angles of discharge Left hand drive can be made from one type "V" Universal Fan—(aside from various angular discharges). For all Blowing and Exhausting work requiring up to four ounces pressure. Built for either pulley or motor drive.

Write for latest Bulletin.

Fig. 8 shows Type "V" Bottom Horizontal Right Hand Universal Fan. Pulley drive.

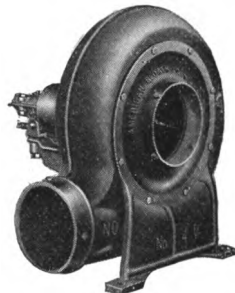


Fig. 8

### "VENTURA" DISC VENTILATING FAN

For delivering large volumes of air at low pressure or against small resistances.

Low price—Small power consumption and inexpensive to install.

For Ventilating rooms and buildings—Ventura, motor driven, ventilating fans 650 C.F.M. to 17,500 C.F.M.

For ventilating small mines or at any mine where a disc fan can be used—Engine or Motor driven—from 12,000 C.P.M. to 100,000 C.F.M. resistance not to exceed 1" W.G.

Write for complete information.

Fig. 9 shows Ventura motor driven Ventilating fan.

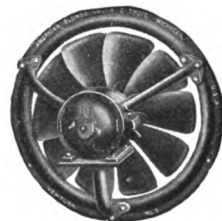


Fig. 9

# WARREN WEBSTER & COMPANY

Established 1888

MAIN OFFICE AND FACTORY, CAMDEN, N. J.

## BRANCHES

NEW YORK  
PITTSBURGH  
INDIANAPOLIS  
HOUSTON  
LOS ANGELES  
SAGINAW

PHILADELPHIA  
ATLANTA  
CLEVELAND  
NEW ORLEANS  
DENVER  
WASHINGTON

CHICAGO  
CHARLOTTE  
ST. LOUIS  
MINNEAPOLIS  
SEATTLE  
WILKES-BARRE

BOSTON  
CINCINNATI  
KANSAS CITY  
SAN FRANCISCO  
SPOKANE

Sole Representatives and Manufacturers for Canada

DARLING BROTHERS, Ltd., MONTREAL

ST. JOHN, WINNIPEG, CALGARY, TORONTO, VANCOUVER, LONDON, ONT.  
THE ATMOSPHERIC STEAM HEATING CO., Ltd., LONDON, ENG.

## THE WEBSTER SYSTEMS OF STEAM HEATING

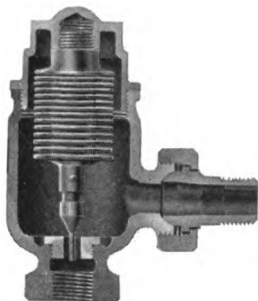
### Vacuum

### Hyo

### Modulation

Having been pioneers in Vacuum Heating and before the engineering world for 26 years there are few in the line who do not know the reputation we have established for excellence of materials and service.

The devices which go to make up a Webster Vacuum or Modulation System are varied in construction and operation so as to meet all requirements, and standing back of each Webster Installation as we do, it is but natural that we prefer to co-operate with the Engineers in the design and construction of the apparatus.



Webster Sylphon Trap

Webster Specialties are furnished on the system basis and although the Sylphon Trap is by far the best water and air relief trap on the market we find many cases where other traps of our manufacture are better adapted to specific cases, so for this reason we would advise Engineers who specify systems of this type to leave the selection of the devices to us, where we are called upon to guarantee results.

The Webster Modulation Valve is made in several types also and can be applied to the supply connection of any kind of radiating surface using steam as a heating medium.

Universal joint—  
Extended stem

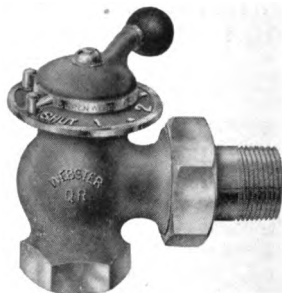
valves for radiators beneath seats or behind grills, chain control for overhead radiators or coils have been perfected to a point of absolute success.

The several types of Webster Modulation Valves are used successfully with or without a vacuum pump according to the nature of the building or buildings in which they are installed and where applied and operated according to our instructions make it possible to modulate the temperature of a room by measuring the quantity of steam admitted.

The removal of air and water of condensation from radiators, coils or piping is accomplished successfully without steam leakage. The Webster Sylphon Trap being the most efficient device for that purpose, operating as it does at any pressure or vacuum from 15 pounds above to 15 inches below atmosphere, being compensated for pressure.

A perfect balance within this system can be maintained by the application of our Hylo method with which a high vacuum can be carried on trunk lines and lower vacuums on branches, making lifts and difficult situations easy to overcome.

For Convenience and Economy in heating, there is no better method than "The Webster" and with our trained engineering corps, backed by our ability to make good, the slogan that "The Webster Guarantee is the Owners Insurance Policy" is a fact and not a theory.



Webster Modulation Valve

## WARREN WEBSTER & COMPANY

### WEBSTER APPLIANCES FOR USE WITH THE WEBSTER SYSTEM

From the various appliances listed below we select such as are required for the installation of the Webster System.

Vacuum Pump—H.P.—L.P.—Power  
with Motor

Suction Strainer

Gauges and Gauge Board

Vacuum Pump Governor

Lift Fittings

Air Separating Appliances

Air Separating Tank

Receiving Tank

Hydro Pneumatic Tank

Hylo Sets—Controller, Trap, Gauges,  
Etc.

Expansion Joints

Automatic Water and Air Relief Traps—

For Radiators

For Coils

For Blast Coils

For Dripping Mains

For Dripping Risers

For Hot Water Generators

For Cooking and Mfg. Apparatus

For Dryers

Thermostatic Traps

Dirt Strainers

Air Conditioning apparatus for Cleans-  
ing, Cooling, Humidifying and  
De-humidifying

Modulation Control Valves

Standard, Special, Extended Stem and  
Chain Control

Modulation Vent Trap

Special Vent Valve

Damper Regulator

Conserving Valve

Water Line Governor

Boiler Feeder

Vacuum Breaker

Feed Water Heater

Chemical Purifier

Condensation Meter

Steam Separator

Oil Separator

High Pressure Trap

Low Pressure Trap

Oil Trap

Atmospheric Relief Valve

From the above list have been selected the appliances for more than 7000 Webster Systems Installations throughout the United States and Canada.

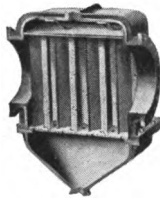
### WEBSTER STEAM AND OIL SEPARATORS

WEBSTER STEAM SEPARATORS for the protection and added economy of engines, turbines and pumps, and Webster Receiver Separators giving in addition a means for permitting smaller piping and for equalizing pulsations, are manufactured in types for any direction of flow (horizontal, vertical or angle); of either cast iron or cast steel, and for high or low pressure.



Webster Steam  
Separator

Webster Oil Separators for either pressure, atmospheric or vacuum conditions and Webster Receiver Oil Separators for use with low pressure turbines or other service are made for horizontal vertical or angular direction of flow and of several types



Webster Oil  
Separator

depending upon operating conditions. Exhaust steam which has passed through any type of Webster Oil Separator may, when condensed, be returned to boilers or used for manufacturing purposes with perfect safety.



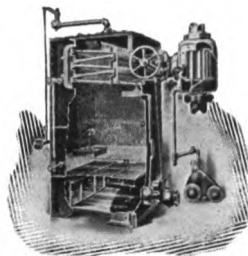
Webster Steam  
Separator

(Continued on next pages)

(Continued from preceding pages)

**WARREN WEBSTER & COMPANY****WEBSTER FEED WATER HEATERS**

**WEBSTER OPEN FEED WATER HEATERS** are built in all types and sizes for any conditions of service, space, head-room, etc. They can be furnished either Standard Type (induction principle with oil separator attached to heater shell) or Preference Type (the most improved form of Cut-Out Heater using a Gate Valve in connection with an Oil Separator of ample size to purify all steam passing through the exhaust main to both the Feed Water Heater and to a Heating or Drying System or to Low Pressure Turbines.)

**Class EB Cut-Out Type**

Class "EB"—500 to 7000 horsepower capacities—vertical rectangular pattern—upward flow filtration.

Class "EC"—500 to 7000 horsepower capacities—vertical rectangular pattern—upward flow filtration.

Class "ED"—500 to 15000 horsepower capacities—horizontal cylindrical pattern (particularly adapted for low head-room) upward flow filtration.

Class "EF"—75 to 450 horsepower capacities—vented rectangular one-piece body type—either upward or downward flow filtration as required.

The Webster Heaters, Extra Storage Type are designed to provide large quantities of hot water immediately available for manufacturing purposes such as in paper mills, tanneries and dye houses.

The Webster Chemical Purifier is a Feed Water Heater and Purifier of the Hot Process Type using simple and cheap chemicals for the thorough purification of hard scale forming boiler feed waters.

All Webster Feed Water Heaters embody the following special features:

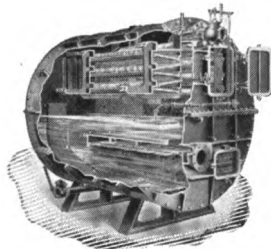
(a) Copper Heating Trays; light, easy to clean, durable and permitting the most intimate intermixture of steam and water because of the small perforations obtainable by the use of this metal.

(b) Open Sink Pans (instead of hollow floats)—for automatically controlling water inlets and overflow—positive in action, cannot become inoperative except by abuse.

(c) Complete segregation of oil separator drips from any connection with other openings into the Heater, thus preventing oil contamination otherwise caused by accident or negligence.

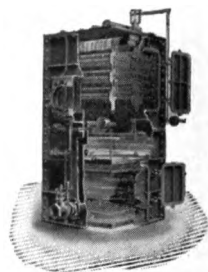
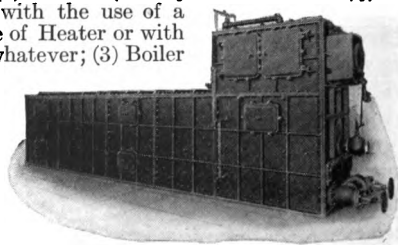
(d) Vacuum Principal: by which the heater assists the passage of steam into itself, thereby reducing back pressure upon engines.

Webster Heaters Save (1) Fuel (usually from 10 to 17%) (2) Water (usually from 10 to 14%) as compared with the use of a closed type of Heater or with no heater whatever; (3) Boiler

**Class ED Standard Type**

repairs due to boiler strains; and (4) Boiler cleaning expense due to their action as Water Purifiers.

Note: While we do not manufacture a metering device, our arrangements with the makers of these devices permit us to offer Webster Feed Water Heaters in combination with any of the best known and most efficient instruments of either the "V" Notch or other open tank types, or of the Venturi type.

**Class EC Standard Type****Extra Storage Type**

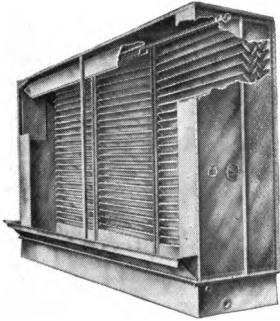
## WARREN WEBSTER & COMPANY

### WEBSTER AIR CONDITIONING APPARATUS

Air Cleansing—Air Cooling—De-Humidifying

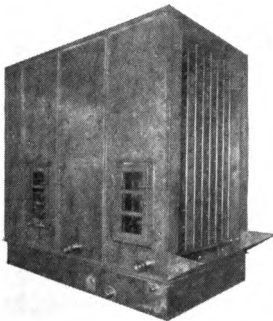
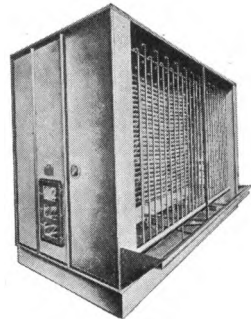
Automatic Control of Humidity

Reclamation of Materials in Connection with Exhaust Systems



The Webster Standard Air Washer is designed specifically for air cleansing; cooling of the air by evaporation being relatively unimportant. This apparatus commends itself, particularly for the extreme simplicity of its construction, economy of floor space, ease of operation and especially for its effectiveness.

The Webster "Type A" Air Washer is designed primarily for cooling air by evaporation; the spray water being recirculated. Where a high degree of cooling by evaporation is desired, in addition to Air Cleansing, this apparatus is especially recommended.



The Webster "Type B" Air Washer is designed primarily for cooling or de-humidifying air by the use of cold well water or water cooled by ice or mechanical refrigeration; it is designed to secure the highest refrigerating effect from the cold spray water. In addition to this it is a most efficient air cleansing apparatus and will cool air, by evaporation, to the saturation temperature. This apparatus is particularly applicable in the special requirements of industrial plants, and where constant temperature, humidity or both are required the year round.

Every type of Webster Air Washer may be readily arranged for automatic humidity control in winter by means of the Webster System of Dew-Point Control—simple, accurate and efficient.

*Specifications and literature will be furnished upon request.*

## THE GRISCOM-RUSSELL CO.

Successors to THE GRISCOM-SPENCER CO., THE RUSSELL ENGINE CO.,  
and THE JAMES REILLY REPAIR AND SUPPLY CO.

NEW YORK

PHILADELPHIA

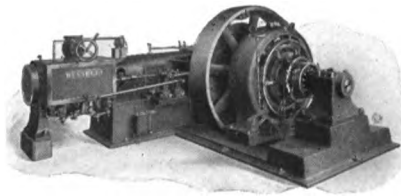
CHICAGO

SAN FRANCISCO

ENGINEERS & MANUFACTURERS  
LAND & MARINE

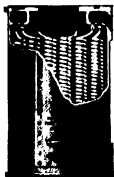
POWER PLANT EQUIPMENT  
STEAM SPECIALTIES

15 H. P.  
to  
2000 H. P.



Russell Four Valve Engine

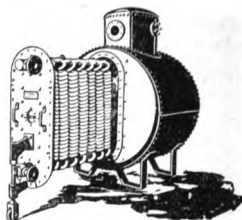
Single Valve  
Four Valve  
Simple Com-  
pound  
Side Crank



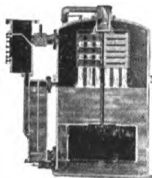
Reilly Multicoil  
Feed Water  
Heater

Highest efficiency per square foot of heating surface. Every coil may be inspected without breaking pipe joints. Coils tested to 300 pounds. Millions of horse power capacity in daily use.

Pure Water without scale difficulty. Easily cleaned—require small space. All coils pure copper—no brazing—interchangeable



Reilly Multicoil Evaporator



Massillon Open  
Feed Water Heater

This heater is of cast iron construction throughout. Has by-pass integral with oil separator. Large scale trays—upward filtration—ample storage capacity.

We also manufacture and sell a complete line of steam and oil separators, feed water filters, fuel oil heaters, oil coolers and other specialties.



*Write for Catalogues*



## C. J. TAGLIABUE MFG. CO.

18 to 88 THIRTY-THIRD STREET, BROOKLYN, N. Y.

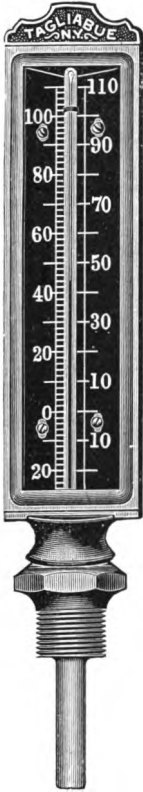
BOSTON  
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BRANCH OFFICES  
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ST. LOUIS

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NEW ORLEANS

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SAN FRANCISCO

**MANUFACTURERS OF INSTRUMENTS FOR INDICATING, RECORDING  
AND CONTROLLING TEMPERATURE AND PRESSURE.**



Hohmann-type  
Thermometer

### MERCURIAL THERMOMETERS

Hohmann-type, as well as types of lower quality, in various sizes, forms and scale-ranges as required for the particular applications to

Stationary Power Plants  
Marine Power Plants  
Refrigeration Systems  
Water Cooling and Distillation  
Ventilating and Heating, etc.

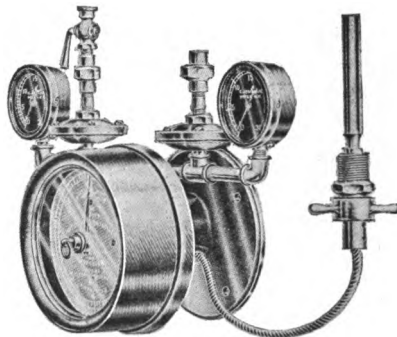
### AUTOMATIC CONTROLLERS

Of several types and various forms, according to requirements, for automatically maintaining—at exact point desired—either temperature or pressure when applied to

|                           |                          |
|---------------------------|--------------------------|
| Condensers                | Forced and Induced Draft |
| Feed Water Heaters        | Systems                  |
| Hot Water Service Tanks   | Water Purification       |
| Stoker and Blower Systems | Condensing Systems, etc. |

### GAGES

Mercurial, Water and Oil, of various types, for Vacuum and Pressure.



"Perfect" Type Automatic Temperature Controller

### OIL TESTING INSTRUMENTS

Hydrometers, Viscosimeters, Flash and Burning Point Testers, Freezers, Gage and Wantage Rods, etc.

### MISCELLANEOUS

Engineers' Testing Sets, Pyrometers, Barometers, Hygrometers, Hydrometers, CO, Thermoscope, etc.

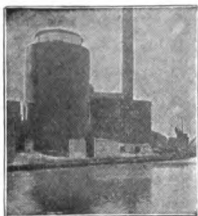
## THE KENNICOTT COMPANY

1115 State Street

CHICAGO, HEIGHTS, ILLINOIS

**EQUIPMENT FOR THE SOFTENING, FILTRATION, MEASUREMENT AND STORAGE OF WATER. STEEL STACKS, TANK CARS, TANKS AND TOWERS. STEEL UNDERFRAMES. GENERAL STEEL PLATE CONSTRUCTION**

### KENNICOTT WATER SOFTENER



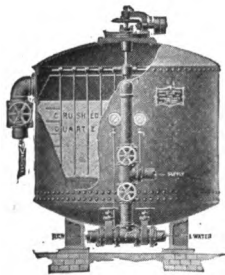
Type K Softener  
150,000 gal. per hour

The Kennicott Water Softener is the product of years of experience in handling difficult water problems. This Softener automatically treats varying quantities of water correctly with the correct quantities of material always in proper proportion, requires only a small amount of attention and softens water at a minimum cost.

The Kennicott Softener is the only Softener where the parts which regulate the feed of chemicals do not come in contact with the chemicals. Accuracy in feeding is thereby maintained.

The Kennicott Softener has been built in various sizes from 500 gallons of water per hour to 150,000 gallons per hour—the largest continuous steeltank Softener in the world having been built and installed by the Kennicott Company.

### KENNICOTT-JEWELL FILTERS



Kennicott-Jewell Filter

If troubled with muddy water, the KENNICOTT-JEWELL FILTER will solve your problem. The result of 25 years' experience in filtration. Equipped with our patented airless negative head strainer system permitting direct suction connection if desired. The most turbid water can be made clear by our Pressure or Gravity filters. Installed for some of the largest power plants, office buildings and manufacturing industries in the world.

The Kennicott-Jewell filter will give you a clear bright water free from stain and sediment.

### KENNICOTT WATER WEIGHERS



Kennicott Water Weigher

Do you know your evaporation?

Do you know how much steam you make each day?

Do you know how much you pay for steam?

Do you know which fuel is most economical?

These questions and many other important questions are answered **ACCURATELY** by the KENNICOTT WATER WEIGHER.

This device operates automatically and continuously. It receives water from open heater pipe line or any other source and delivers it in unit charges of definite weight. A counter conveniently located registers each unit charge delivered so that the total quantity of water which passes through the weigher is accurately obtained. This remarkable weigher is guaranteed to record the correct weight of water to within  $\frac{1}{2}$  of one per cent. No other device is as accurate.

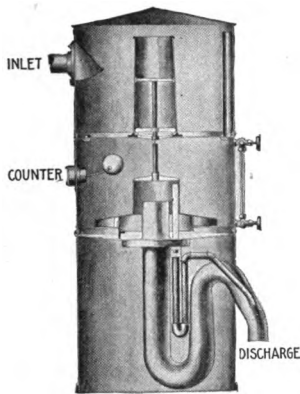
*Write now for further information*



# WILLCOX ENGINEERING CO., Inc.

SAGINAW, MICHIGAN, U. S. A.

## THE WILLCOX WATER WEIGHER



Vertical Section of Portable Weigher for evaporative and condensation tests  
Style B

The Willcox Water Weigher is a device for automatically weighing and recording the water fed to boilers. It takes water from any source, such as a feed water heater, tank, pump, or hydrant, at any rate of flow or at varying rates, and delivers it intermittently in charges of uniform weight.

It will weigh hot feed water from an open heater, cold water from a hydrant, water of condensation from vacuum pans or heating systems; also chemicals, volatile oils, sugar juices, etc.

**Operation:** The charge is weighed by a liquid column of fixed height, through the medium of an air balance. The unit charge is dumped automatically by the sudden release of the entrapped air—an extremely accurate method of balancing.

**Accuracy:** Each weigher is guaranteed to weigh within one per cent. of perfect accuracy at any rate of supply up to its maximum capacity.

**Styles and Capacities:** The Willcox Water Weigher is built in several styles to suit various requirements: portable weigher for evaporative and condensing tests; and power plant sets for permanent installation. All capacities from one thousand pounds per hour up to half a million pounds.

**Plans for Installation:** Suggestions, sketches and plans for proposed installations are furnished free of charge by the Willcox Engineering Company. We have competent engineers and draftsmen for the purpose of assisting prospective customers in planning suitable arrangements to meet local conditions.

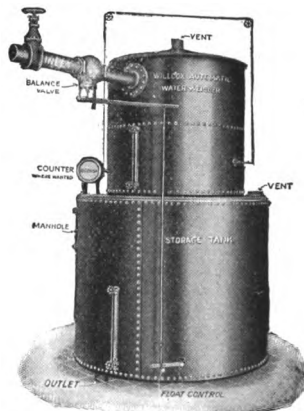
**Savings Secured in Boiler Plants:** By furnishing a simple, reliable, automatic self-recording device for continuously and accurately recording every pound of water pumped to the boilers, the Willcox Water Weigher offers a means of segregating boiler evaporation cost from engine and generator performance, thereby giving a sure means of determining from day to day whether or not a proper evaporation is being secured per pound of coal.

### GENERAL DIMENSIONS—STYLE A BUILT OF BOILER PLATE

| Size No. | Maximum rate of weighing, in lbs. of water per hour | Size Inlet, In. | Shell, Thickness | APPROXIMATE   |                                 |
|----------|---|-----------------|------------------|---------------|---------------------------------|
|          |   |                 |                  | Ship'g Weight | Weight of water per unit charge |
| 1        | 500,000   | 10              | 3/8              | 4000          | 5000                            |
| 3        | 300,000   | 8               | 5/16             | 3000          | 3500                            |
| 5        | 200,000   | 6               | 1/4              | 2100          | 2700                            |
| 7        | 150,000   | 6               | 1/4              | 1850          | 2250                            |
| 9        | 100,000   | 6               | 3/16             | 1500          | 1800                            |
| 11       | 75,000  | 4               | 3/16             | 1200          | ....                            |
| 12       | 62,500  | 4               | 3/16             | 1100          | 1180                            |

### STYLE B—INGOT IRON

|    |        |    |      |     |     |
|----|--------|----|------|-----|-----|
| 14 | 40,000 | 3  | .... | 600 | 680 |
| 16 | 25,000 | 2½ | .... | 400 | 420 |
| 18 | 15,000 | 2  | .... | 275 | 200 |
| 20 | 10,000 | 2  | .... | 175 | 120 |
| 22 | 5,000  | 1½ | .... | 150 | 60  |



The Willcox Automatic Water Weigher with Storage Tank. Style A

Send for Water Weigher Catalog W7

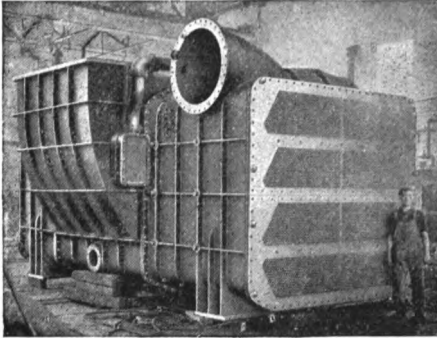
## WHEELER CONDENSER AND ENGINEERING CO.

MAIN OFFICE AND WORKS: CARTERET, NEW JERSEY

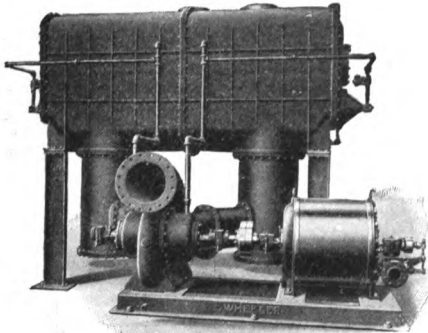
### BRANCHES

NEW YORK, BOSTON, PHILADELPHIA, CHICAGO, ST. LOUIS, ST. PAUL, CINCINNATI, PITTSBURGH,  
DALLAS, CLEVELAND, DENVER, SAN FRANCISCO, SALT LAKE CITY, LOS ANGELES, SEATTLE, PORT-  
LAND, TUCSON, ARIZ., CHARLOTTE, NEW ORLEANS, ATLANTA, LONDON, YOKOHAMA, TRIESTE,  
MELBOURNE, PARIS.

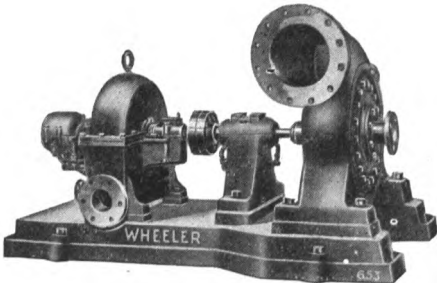
### MANUFACTURERS OF COMPLETE CONDENSING EQUIPMENTS



**Wheeler High Vacuum Surface Condenser**



**Wheeler Rectangular Jet Condenser (Counter-Current  
Rain Type) for High Vacuum Steam Turbines**



**Turbo Air Pump, Type TAC with Combined Con-  
densate Pump**

#### **HIGH VACUUM SURFACE CONDENSERS**

For turbines of any capacity, condensing equipments operating on wet or dry system, tube surface of condenser arranged to give best distribution of steam for high efficiency and designed on the dry tube principle to give maximum rate of heat transmission. Built as base condensers for vertical turbines, also for horizontal turbines with either rectangular or cylindrical shells.

#### **HIGH VACUUM JET CONDENSERS**

For turbines of any size to maintain vacuum of 28 inches and up. Built on the countercurrent "rain type" principle to insure maximum temperature of discharge water, and therefore, minimum quantity of water, and minimum pumping cost.

#### **WHEELER TURBO AIR PUMPS**

High Speed Rotary type for jet or surface condensers. Direct connected to turbine or motor. Will maintain 98-99% vacuum.

#### **WHEELER-EDWARDS AIR PUMPS FOR AIR AND CONDENSATE**

Eliminate expense of independent air and hot well pumps. No suction or bucket valves.

#### **WHEELER ROTATIVE DRY VACUUM PUMP**

Will maintain a vacuum within .5" of barometer. For high vacuum jet condensers and large dry tube surface condensing equipments. Clearance effect reduced by rotative sniff valve.

#### **CENTRIFUGAL PUMPS FOR ALL SERVICES**

Circulating, tail water and hot well pumps for condensing work. Pumps of all sizes driven by motor, steam turbine or engine for water works, irrigation, etc.

#### **FORCED DRAFT STEEL TOWERS**

Recommended for efficient cooling of water where ground space is limited, and smallest size tower must be used.

#### **NATURAL DRAFT WOODEN TOWERS**

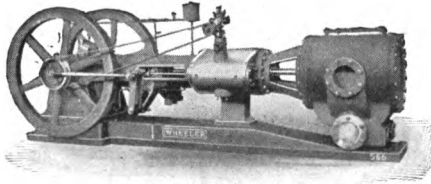
For manufacturing and industrial plants, also central stations where a supply of cooling water is not available. Operating cost consists of water pumping cost only. Designed for special low lift so as to reduce this cost to the minimum.

## WHEELER CONDENSER AND ENGINEERING CO.

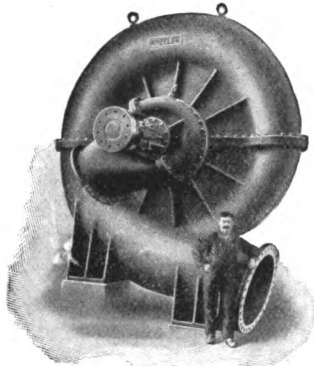
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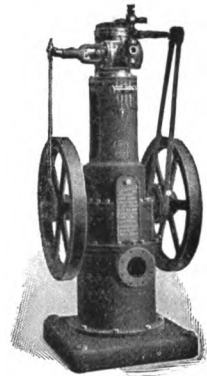
**Wheeler Barometric  
Condenser**



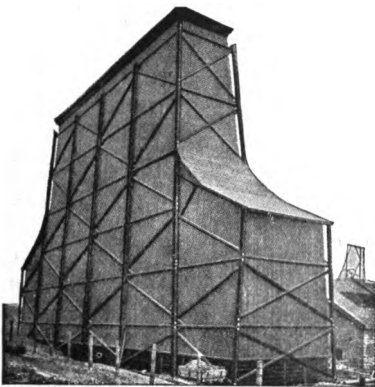
**Wheeler Rotative Valve Reciprocating  
Dry Vacuum Pump**



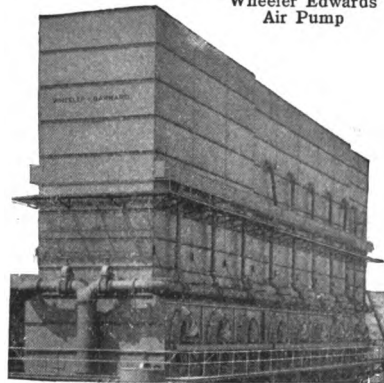
**Wheeler Centrifugal Pump**



**Wheeler Edwards  
Air Pump**



**Wheeler-Balcke Natural Draft Wooden  
Cooling Tower**



**Wheeler-Barnard Forced Draft Cooling Tower**

## C. H. WHEELER MANUFACTURING CO.

MAIN OFFICE AND WORKS, PHILADELPHIA, PA.

BRANCH SALES OFFICES:

NEW YORK  
CINCINNATI

BOSTON  
CHARLOTTE

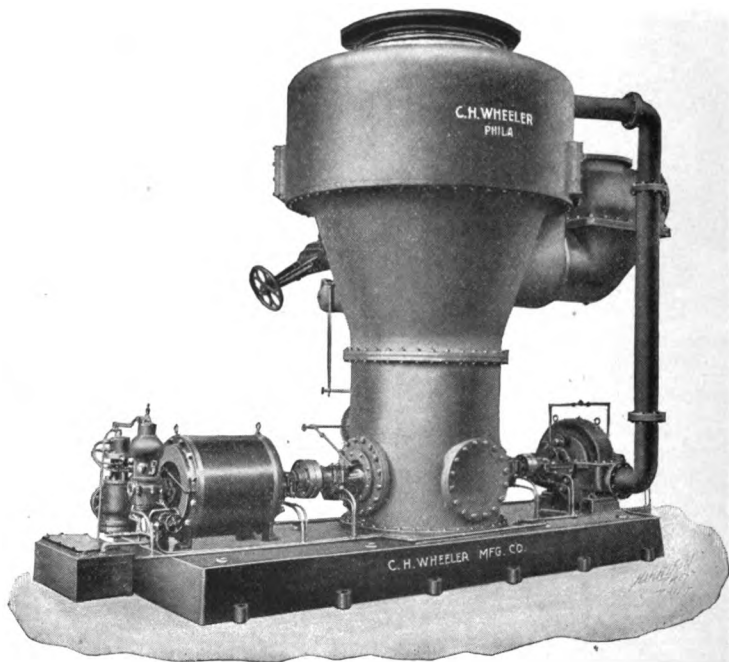
CHICAGO  
SAN FRANCISCO

CLEVELAND

PITTSBURGH  
NEW ORLEANS

**SURFACE CONDENSERS, JET CONDENSERS, VACUUM PUMPS, CENTRIFUGAL PUMPS, DIRECT ACTING STEAM PUMPS, FEED WATER HEATERS, ENGINES, EXHAUST CONNECTIONS, COOLING TOWERS.**

### LOW LEVEL JET CONDENSERS



**An Attractive Arrangement of Condensing Apparatus**

The above represents a C. H. WHEELER IMPROVED High Vacuum Jet Condensing Equipment. The air is removed by a Thyssen Patent Entrainment Vacuum Pump and the injection water and condensed steam are removed by submerged Centrifugal Removal Pumps.

Pumps operate at high speed, being direct connected to a steam turbine.

Built in two general types, one with side exhaust inlet and the other with inlet on the top of the condenser chamber. The latter is the most desirable arrangement of a jet condenser.

We specialize in the design and construction of steam condensing machinery for highest vacuum with minimum power consumption.

**Surface, Jet and Barometric Condensers.**

**Vacuum Pumps of the Reciprocating, Rotary and Hydraulic Entrainment types.**

**Centrifugal Pumps, motor, engine, turbine and belt-driven.**

**Closed Feed Water Heaters.**

**Special Exhaust Gate Valves.**

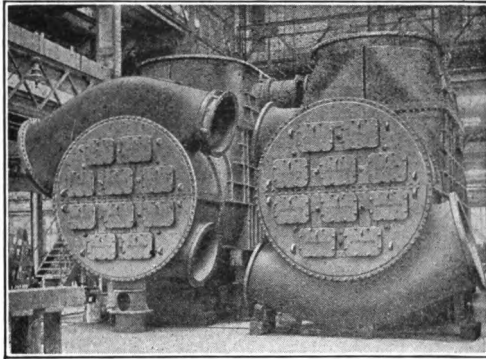
**Copper Expansion Joints.**

**Multiflex Atmospheric Exhaust Relief Valves.**

# HENRY R. WORTHINGTON

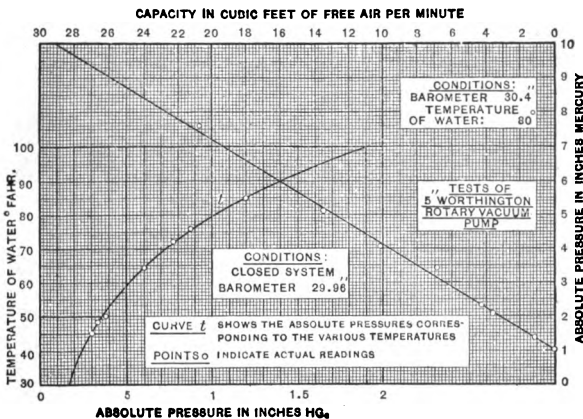
115 BROADWAY, NEW YORK WORKS, HARRISON, N. J.

**MANUFACTURERS OF SURFACE, BAROMETRIC AND CENTRIFUGAL JET CONDENSING SYSTEMS, COMPLETE WITH AUXILIARIES FOR HIGH VACUUM WORK:—COOLING TOWERS, DUPLEX DIRECT-ACTING, CENTRIFUGAL, TURBINE PUMPS FOR EVERY SERVICE; BOILER FEED, ELEVATOR, FIRE, PRESSURE PUMPS; WATER METERS; WATER WORKS, SEWAGE AND DRAINAGE PUMPING ENGINES**



## WORTHINGTON TWIN CONDENSERS

50,000 Square Feet for 30,000 K.W. Turbine. One of three units to be installed by the INTERBORO RAPID TRANSIT COMPANY in their 74th St. Power House, New York City.



## THE WORTHINGTON HYDRAULIC VACUUM PUMP

Shows perfect vacuum efficiency upon a closed system and variation in capacity and pressure with varying quantities of air corresponding exactly with the theoretical—within the range of observation: Maintains 99% to 99.5% vacuum in actual service.

W 270. 8

## BEST MANUFACTURING CO.

FOUNDED 1884

INCORPORATED 1899

PITTSBURGH, PA.

BRANCH OFFICES:

NEW YORK

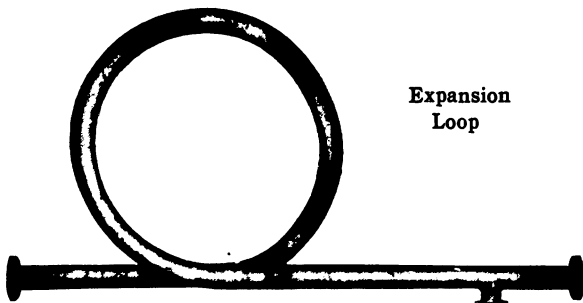
PHILADELPHIA

CHICAGO

**MANUFACTURERS AND ERECTORS OF MATERIALS FOR STEAM, AIR AND HYDRAULIC PIPING SYSTEMS: VALVES, FITTINGS, FLANGES, FLEXIBLE JOINTS, EXPANSION JOINTS OF VARIOUS TYPES, PIPE BENDS, FABRICATED PIPE, VANSTONE JOINTS, WELDED HEADERS, GULLAND AUTOMATIC VALVES AND WATER COLUMNS, ETC.**

### PIPING FOR POWER HOUSE, MINE, MILL, ETC.

For more than 30 years we have specialized in power piping. We now occupy a new plant especially designed and equipped for this class of work. Our long experience in this field, together with the unsurpassed facilities of our plant, insures the successful operation of any piping system which we fabricate or fabricate and install.



Expansion  
Loop

We are prepared to furnish pipe bends of any size pipe obtainable, either in wrought iron, steel, brass or copper, in any possible contour.

We flange straight and bent pipe in any approved manner, e.g., Threaded, Shrunk, Vanstone or Welded.



Welded Steel Header

For the purpose of reducing the number of flanged joints to a minimum, we weld either seamless forged steel necks or vanstone necks onto the pipe, thus producing our Welded Steel Header. The Headers of this type which we have furnished have, without exception, given the utmost satisfaction in service.

### IRON CASTINGS

Our foundry facilities enable us to make castings in weights up to 50 tons. We are particularly well equipped for furnishing special castings required in connection with turbine installations.

### FLANGED FITTINGS

Our line of flanged fittings and flanges is complete from Low Pressure to Heavy Hydraulic, made of metals suitable for the different services. A large assorted stock enables us to make prompt shipments of staple sizes. All of our flanged fittings conform to the "American Standard."

## BEST MANUFACTURING CO.

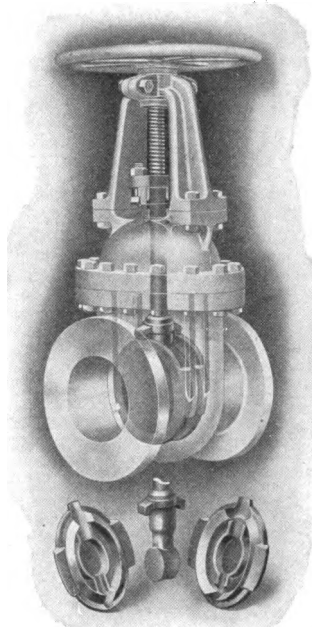
### VALVES

Our line of Valves, embracing the following types, viz., Gate, Globe, Angle, Back Pressure, Exhaust Relief, and Combination Back Pressure and Exhaust Relief, is complete in all suitable metals and weights for the various services. We supply valves with any desired operating device, e.g., Hand or Chain Wheel, Bevel Gear, Spur Gear, Hydraulic Cylinder or Motor Drive. Space prohibits a detailed description of our complete line, but we will gladly furnish all information desired regarding any of our valves upon application.

"Best" Low Pressure and Standard Valves are furnished with double discs and parallel seats.

"Best" Extra Heavy, Super-Heat, and Extra Heavy Hydraulic Valves are furnished with the device herewith illustrated, i.e.

**STEM AND DISC HOLDER IN ONE PIECE WITHOUT JOINT WITH DOUBLE DISCS MADE ADJUSTABLE IN ANY PLANE BY BALL AND SOCKET JOINT ON BACK.**



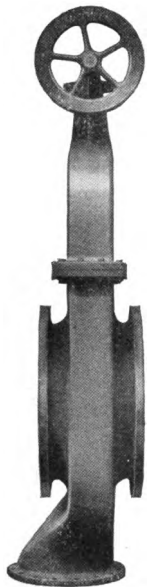
Our valves are constructed with oval bodies and are assembled with through bolts only, tap and stud bolts being entirely eliminated.

"BEST" CAST STEEL VALVES FOR SUPER-HEATED STEAM are built with Monel Metal Trimmings and with the One Piece Stem and Disc Holder, above described, of Monel Metal. A special feature of this design is the stuffing box with multiple condensing chamber. These valves are designed and built for working pressures up to 350 lbs., with temperatures up to 800° Fahr. In addition to the usual hydrostatic test, we test these valves under super-heated steam.

"BEST" LOW PRESSURE GATE VALVES WITH BACK OUTLETS are designed for service between turbine and condenser. As they perform the functions of the ordinary gate valve and tee, they effect a considerable economy of space. We build these valves in sizes from 12" up to any desired dimension.

We build special valves for hydroelectric and irrigation projects, and solicit the opportunity of submitting estimates on anything required in this line.

*Ask for our catalogue No. 103, also for our "Model Piping Specifications."*



**Low Pressure Gate Valve With Back Outlet**



**Superheat Valve**

**CRANE CO.**

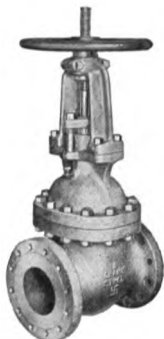
Founded by R. T. Crane 1855

**836 SO. MICHIGAN AVE. CHICAGO ILL.**Cable address, **CraneCo, Chicago.**Branches in **Forty-four Cities.**

**CAST STEEL VALVES AND FITTINGS; CRANE TILT STEAM TRAPS;  
VALVES, COCKS AND FITTINGS IN BRASS, MALLEABLE IRON AND  
CAST IRON; STEAM SPECIALTIES; COMPLETE PIPING EQUIPMENT;  
PIPE BENDS; PIPE FITTERS' TOOLS; ENGINEERS' SUPPLIES, ETC.**

**CRANE CAST STEEL VALVES AND FITTINGS**

We have been manufacturing for some time a line of steel fittings to meet a steadily growing demand for a superior grade of goods, especially adapted for High Pressure, Saturated and Superheated Steam Lines and Extreme Hydraulic Service. These are suitable for steam working pressures up to 350 pounds, and for superheat up to a total temperature of 800 degrees.

**No. 7A**

Cast steel body, bonnet, yoke and disc (sizes above 2 inch, disc nickel faced; 2 inch and smaller, solid nickel disc) nickel seats and rolled Monel Metal Stem.

**Nos. 21A, 23A and B, 27A, 29A and B**

Cast steel body, yoke and swivel disc (sizes above 3½ inch, disc nickel faced; 3½ inch and smaller, solid nickel disc) nickel seats and rolled Monel Metal or steel stems.

**No. 101D and No. 105D**

Extra Heavy Cast Steel Flanged Fittings,

**We carry the following steel goods in stock:**

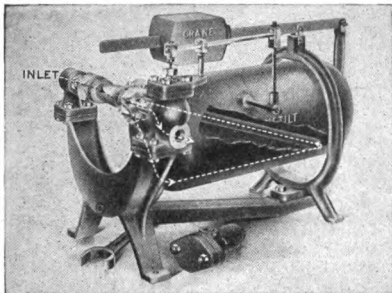
|   |             |
|---|-------------|
| No. 7A Straight-Way Valves  | 12 inch     |
| Outside screw and yoke, nickel seats, rolled Monel Metal stem.                        | and smaller |
| No. 9A Straight-Way Valves  | 14 inch     |
| Outside screw and yoke, nickel seats, rolled Monel Metal stem.                        | and smaller |
| No. 21A Globe Valves  | 6 inch      |
| Outside screw and yoke, nickel seats, rolled Monel Metal stem                         | and smaller |
| No. 23A and B Angle Valves  | 6 inch      |
| Outside screw and yoke, nickel seats, rolled Monel Metal, or cold rolled steel stems. | and smaller |
| No. 101D Steel Flanged Elbows   | 12 inch     |
| Straight sizes.   | and smaller |
| No. 105D Steel Flanged Tees   | 12 inch     |
| Straight sizes.   | and smaller |
| Screwed Elbows  | 4 inch      |
| Straight sizes.   | and smaller |
| Screwed Tees  | 4 inch      |
| Straight sizes.   | and smaller |

Further particulars will be found in our Special Steel Catalogue No. 70, October 1910.



CRANE CO.

CRANETILT STEAM TRAPS



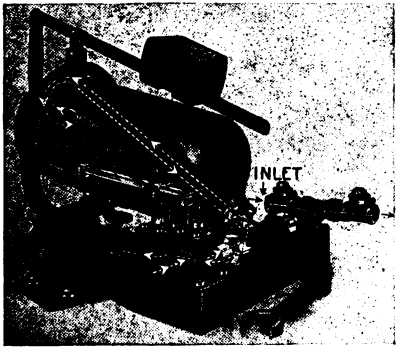
NON-RETURN PATTERN

The receiving or tilting tank is made of malleable iron, cast in one piece of uniform thickness. They are tested to 800 pounds hydraulic pressure per square inch and are fully capable of withstanding the severe strains to which Tilting Traps are subjected.

All operating parts are on the outside and the Discharge Valves are of special design, having exceptionally large openings. The brass working parts are made of "Crane Hard Metal" which has wearing qualities almost equal to

steel and successfully resists the cutting effects of steam and water.

| Size of Trap Number | List Price including Sediment Trap, but no Check Valves or Fittings | Pipe Connections                |                                 | Capacities per Hour Based on Ordinary Condensing Conditions                  |  | Dimensions                           |                       |
|---------------------|---|---------------------------------|---------------------------------|--|--|--------------------------------------|-----------------------|
|                     |   | Size of Inlet and Outlet Inches | Size of Inlet and Outlet Inches | Lineal Feet of 1 Inch Pipe Trap will Drain with 50 lbs. Pressure at the Trap | Pounds of Water Discharged with 50 lbs. pressure at the Trap | Over All Inches                      | Extreme Height Inches |
| 30                  | \$25. 00  | $\frac{1}{4}$                   | $\frac{1}{4}$                   | 6,000  | 1,200  | $19\frac{1}{2} \times 12$            | $19\frac{1}{4}$       |
| 32                  | 45. 00  | $\frac{1}{2}$                   | $\frac{1}{2}$                   | 15,000   | 3,000  | $24\frac{1}{2} \times 14\frac{1}{2}$ | $24\frac{1}{2}$       |
| 33                  | 55. 00  | $\frac{3}{4}$                   | $\frac{3}{4}$                   | 30,000   | 6,000  | $28 \times 18\frac{1}{4}$            | 28                    |
| 34                  | 85. 00  | 1                               | 1                               | 50,000   | 10,000   | $32\frac{1}{2} \times 20\frac{1}{2}$ | 31                    |
| 35                  | 115. 00   | $1\frac{1}{4}$                  | $1\frac{1}{4}$                  | 75,000   | 15,000   | $36 \times 23$                       | 33                    |
| 36                  | 150. 00   | $1\frac{1}{2}$                  | $1\frac{1}{2}$                  | 100,000  | 20,000   | $42 \times 25\frac{1}{2}$            | 36                    |
| 37                  | 200. 00   | 2                               | 2                               | 150,000  | 30,000   | $47\frac{1}{2} \times 29\frac{1}{2}$ | 41                    |
| 38                  | 300. 00   | $2\frac{1}{2}$                  | $2\frac{1}{2}$                  | 200,000  | 40,000   | $54 \times 33\frac{1}{2}$            | 50                    |
| 39                  | 425. 00   | 3                               | 3                               | 250,000  | 50,000   | $61 \times 37\frac{1}{4}$            | 56                    |



DIRECT RETURN PATTERN

This pattern will automatically return all condensations, at any pressure or temperature, directly back into the boiler. Direct Return Traps require live steam from the boiler for their operation, which is automatically controlled through the steam port of the Duplex Valve. Cranetilt Steam Traps will handle condensation from all sources, under any condition of service, and under any pressure up to 250 pounds. They also have a maximum discharging capacity. Each trap is given a thorough steam test and guaranteed in perfect working order before shipment.

| Size of Trap Number | List Price including Sediment Trap, Two Swing Check Valves, Tee and Nipples | Pipe Connections                         |                                     | Capacities per Hour Based on Ordinary Condensing Conditions |   | Dimensions                           |                       |
|---------------------|---|--|-------------------------------------|---|---|--------------------------------------|-----------------------|
|                     |   | Size of Water Inlet and Discharge Inches | Size of Steam and Vent Valve Inches | Lineal Ft. of 1 Inch Pipe Trap will Drain                   | Pounds of Water Trap will Discharge into Boiler | Over All Inches                      | Extreme Height Inches |
| 90                  | \$60. 00  | $\frac{1}{2}$                            | $\frac{1}{2}$                       | 4,000   | 800   | $25 \times 15\frac{1}{4}$            | 27                    |
| 91                  | 75. 00  | $\frac{3}{4}$                            | $\frac{3}{4}$                       | 7,500   | 1,500   | $28\frac{1}{4} \times 19\frac{1}{4}$ | 31                    |
| 92                  | 100. 00   | 1  | 1                                   | 12,500  | 2,500   | $33 \times 21\frac{1}{4}$            | 36                    |
| 93                  | 150. 00   | $1\frac{1}{4}$                           | $1\frac{1}{4}$                      | 18,000  | 3,600   | $37\frac{1}{2} \times 24\frac{1}{2}$ | 38                    |
| 94                  | 200. 00   | $1\frac{1}{2}$                           | $1\frac{1}{2}$                      | 25,000  | 5,000   | $42\frac{1}{2} \times 27$            | 42                    |
| 95                  | 300. 00   | 2  | 2                                   | 39,000  | 7,800   | $51\frac{1}{2} \times 30\frac{1}{4}$ | 50                    |
| 96                  | 400. 00   | $2\frac{1}{2}$                           | $2\frac{1}{2}$                      | 57,500  | 11,500  | $60 \times 34\frac{1}{2}$            | 55                    |
| 97                  | 550. 00   | 3  | 3                                   | 77,500  | 15,500  | $68 \times 38\frac{1}{4}$            | 65                    |
| 98                  | 750. 00   | 4  | 3                                   | 140,000   | 28,000  | $76 \times 44\frac{1}{4}$            | 70                    |

(See also following pages)

(Continued from preceding pages)

## CRANE CO.

### CHICAGO, ILL.

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#### SUMMARY OF CRANE PRODUCTS

We give on this and the succeeding page a description of our line. We carry in stock at our branch houses a large supply of the goods listed below and are prepared to furnish SPECIAL VALVES, FITTINGS, etc., to meet specific requirements or conditions, without delay.

The term STANDARD is applied to those goods intended for steam working pressures not exceeding 125 pounds. The LOW PRESSURE FITTINGS, etc., may be used for STEAM WORKING PRESSURES up to 25 pounds, while the MEDIUM GOODS are intended for 175 to 225 pounds. The EXTRA HEAVY are designed for STEAM WORKING PRESSURES up to 250 pounds.

The proportionate WATER WORKING PRESSURES may be taken as follows: LOW PRESSURE, STANDARD and MEDIUM, 40 per cent greater than the steam pressure on sizes 12 inch and smaller; sizes 14 inch and larger, 20 per cent greater.

#### STANDARD GOODS

We manufacture brass GLOBE, ANGLE and CROSS VALVES, screwed, in sizes from  $\frac{1}{8}$  to 4 inches; and the flanged pattern from  $\frac{3}{4}$  to 4 inches. The brass CHECK VALVES are made in many patterns, the sizes of which run from  $\frac{1}{8}$  to 3 inches. The brass line also includes: HOSE, GARDEN HOSE, COKE OVEN, NEEDLE POINT, STRAIGHT-WAY and HOSE GATE. Our lines of RADIATOR VALVES and FITTINGS, BRASS, STEAM and GAS COCKS are complete. The CAST IRON FITTINGS include COCKS of various patterns; GLOBE, ANGLE and CROSS VALVES with yoke as well as the regular patterns; the sizes of the latter ranging from  $\frac{1}{2}$  to 3 inches. We handle BRASS and CAST IRON PIPE FITTINGS in both the screwed and flanged patterns as well as MALLEABLE PIPE FITTINGS screwed. With the STANDARD GOODS are also included IRON STRAIGHT-WAY VALVES, EXPANSION JOINTS with iron body and brass sleeve, RAILING FITTINGS, DRAINAGE FITTINGS, STEAM FITTERS' and ENGINEERS' TOOLS, PIPE BENDS, and PIPE SUPPORTS, BRACKETS, etc.

#### LOW PRESSURE GOODS

The regular low pressure STRAIGHT-WAY or WEDGE GATE VALVES are made in several patterns and in sizes up to 72 inches. The low pressure PIPE FITTINGS are of the flanged pattern and include ELBOWS, 45 degree ELBOWS, TEES, REDUCING TEES, CROSSES, REDUCING CROSSES, LONG RADIUS ELBOWS, SQUARE and ROUND BASE ELBOWS and TAPER REDUCERS.

#### MEDIUM PRESSURE GOODS

This line includes the CRANE NAVY GLOBE, ANGLE, CROSS and CHECK VALVES made of CRANE SPECIAL BRASS; the screwed pattern being made in sizes ranging from  $\frac{1}{4}$  to 4 inches and the flanged pattern from  $\frac{3}{4}$  to 4 inches. The brass STRAIGHT-WAY or WEDGE GATE VALVES come with non-rising stems, either screwed or flanged, while the rising stem pattern has a yoke and is screwed. We also make in the medium class, GLOBE, ANGLE and CROSS VALVES with FERROSTEEL body, flanged in sizes ranging from 2 to 12 inches; the STRAIGHT-WAY or WEDGE GATE FERROSTEEL VALVES are made in sizes up to 24 inches.

## **CRANE CO.**

### **EXTRA HEAVY GOODS**

Under this heading will be found FERROSTEEL STRAIGHT-WAY VALVES in ten patterns, including the ELECTRICALLY and CYLINDER OPERATED DESIGN; the sizes run up to 24 inches and larger. The FERROSTEEL GLOBE, ANGLE and CROSS VALVES are made with yoke, have hard metal seats and are flanged; the sizes range from 2 to 15 inches. The EXTRA HEAVY VALVE line also include SWING CHECK VALVES, flanged sizes from 2 to 15 inches; GLOBE and ANGLE THROTTLE VALVES, flanged, in sizes from 3 to 8 inches; AUTOMATIC STOP-CHECK VALVES in GLOBE and ANGLE PATTERN, flanged, sizes 2 to 15 inches; EMERGENCY STOP VALVES in sizes from 4 to 16 inches; EXPANSION JOINTS—iron body and brass sleeve, in sizes 2 to 18 inches—these are also made with special traverse and extra long traverse; BALANCED EXPANSION JOINTS; SWIVEL EXPANSION JOINTS; GLOBE, ANGLE, CROSS and CHECK VALVES; REGRINDING SWING CHECK VALVES; HORIZONTAL CHECK VALVES; UNIONS, ROUGH BRASS FITTINGS, MALLEABLE IRON FITTINGS, CAST IRON FLANGED FITTINGS, GASKETS, FLANGED PIPE JOINTS.

### **HYDRAULIC GOODS**

All of these articles have been designed for water working pressures up to from 800 to 1200 pounds. The line includes STRAIGHT-WAY VALVES outside screw and yoke with or without by-pass in sizes from 1½ to 12 inches; SWING CHECK VALVES in sizes from 2½ to 12 inches; GLOBE, ANGLE and CHECK VALVES, MALLEABLE IRON FITTINGS, BRASS UNIONS, FERROSTEEL FLANGED FITTINGS and COMPANION FLANGES for pressures up to 2500 pounds; CAST STEEL HYDRAULIC VALVES, FITTINGS and FLANGES for pressures up to 3000 pounds.

### **PIPE**

We can supply promptly SEAMLESS DRAWN BRASS and COPPER TUBING in iron pipe sizes, STANDARD WEIGHT SPIRAL RIVETED PRESSURE PIPE, STRAIGHT SEAM STEEL RIVETED PIPE, and WROUGHT PIPE—either black or galvanized.

### **SPECIALTIES AND TRIMMINGS**

These are AUTOMATIC EXHAUST RELIEF VALVES, AUTOMATIC STOP CHECK VALVES, CHICAGO and NAVY UNIONS, BOILER FITTINGS, CRANE CEMENT for making tight pipe joints, STEAM WHISTLES, WATER GAUGES, OIL and GREASE CUPS, LUBRICATORS, COCKS, PRESSURE and VACUUM GAUGES, FUSIBLE PLUGS, BACK PRESSURE VALVES, LEVER SAFETY VALVES, POP SAFETY VALVES, BLOW-OFF VALVES, BLOW-OFF CROSSES, PRESSURE REGULATORS, FLOAT VALVES, EXHAUST PIPE HEADS, INJECTORS, AUTOMATIC DUPLEX FEED PUMPS and RECEIVERS, PUMPS, FLEXIBLE JOINTS, KLINGERIT PACKING, E. C. & B. PIPE MACHINES, STEAM and OIL SEPARATORS, CRANE VACUUM OIL SEPARATORS, MACHINE BOLTS.

### **POCKET CATALOGUE**

We have just issued a new edition which will be found very complete and useful. It is designated as No. 40 and dated May 1914.

# HOMESTEAD VALVE MFG. CO.

PITTSBURGH, PA.

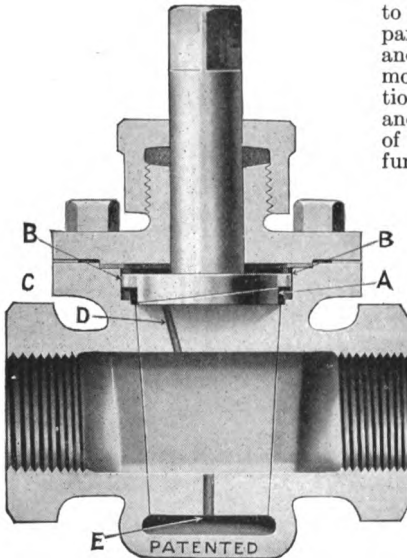
THE HOMESTEAD SELF-LOCKING STRAIGHTWAY, THREE-WAY AND FOUR-WAY HIGH PRESSURE BALANCED PLUG VALVES. THE HOMESTEAD LOCKING COCK.

## THE HOMESTEAD SELF-LOCKING STRAIGHTWAY VALVE

This valve is unlike all others because the seat which is the vital part is absolutely protected from wear. It will readily be seen that this is a great improvement over Globe and Gate Valves where the seat is exposed to pressure and destruction every moment the valve is open.



The Homestead Locking Cock



Homestead Straightway Valve

## THE HOMESTEAD LOCKING COCK

is made with a double external locking device, which forces absolutely tight adherence of the plug to the seat at each end of the quarter turn to which it is limited, insuring easy turning and almost entire freedom from wear, giving you SIMPLICITY, RAPIDITY and DURABILITY combined.

### Construction

This valve is so constructed that when it is closed it is at the same time forced firmly to its seat. This result is secured by means of the traveling cam "A" through which the stem passes. The cam is prevented from turning with the stem by means of the lugs "B" which move vertically in slots. Supposing the valve to be open, the cam will be in the lower part of the chamber in which it is placed, and the plug will be free to be easily moved. A quarter of a turn in the direction for closing it causes the cam to rise and take a bearing on the upper surface of the chamber, and the only effect of further effort to turn the stem in that direction is to force the plug more firmly to the seat. A slight motion in the other direction immediately releases the cam and the plug turns easily, being arrested at its proper open position by contact of the fingers of the cam at the other end of its travel. E. D. D. are balancing ports which allow the pressure to predominate at the top of plug, holding it gently in its seat while valve is open. Made in all sizes up to six inches, and for all pressures up to 5,000 pounds per square inch. Made in Straightway, Three and Four-Way Patterns.

For Steam, Compressed Air and Hydraulic Service.

# THE DARLING PUMP & MFG. CO. Ltd.

WILLIAMSPORT, PA.

## SALES OFFICES:

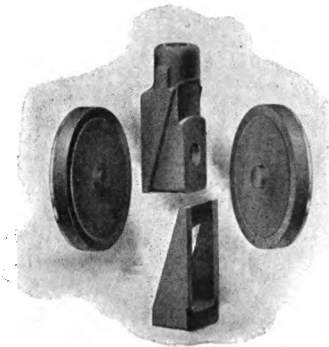
NEW YORK CITY  
149 Broadway

CHICAGO  
The Rookery

PHILADELPHIA  
Commercial Trust Bldg.

**MANUFACTURERS OF DARLING GATE VALVES, BALL CHECK VALVES,  
FIRE HYDRANTS, FLOOR STANDS, INDICATOR POSTS, VALVE BOXES**

## THE DARLING GATE VALVE



**Wedging Mechanism—Shown with  
Parts Separated**

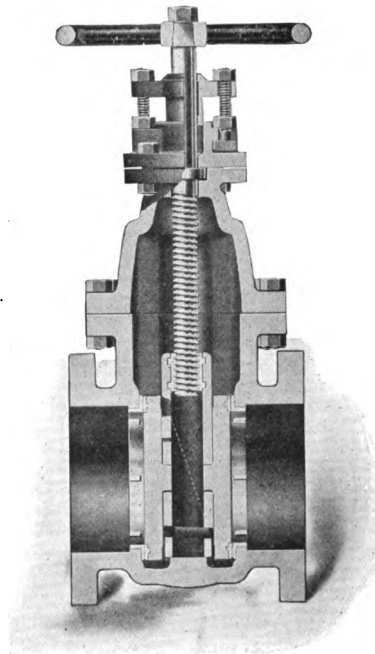
The Gate Discs being plain, no portion of the Wedging Mechanism is formed upon them. These Gate Discs revolve independently of the wedges, and independently of each other. The Revolving Gate Discs change their positions on the Seats each time the Valve is closed, thus distributing wear equally over entire faces of Gates and Seats, ensuring durability.

Gates released before opening, avoiding wear on Seats. Cannot stick or bind.

Simple, reliable, durable.

Darling Valves will remain tight longer than any others. They are made for all pressures and purposes.

The Darling Patented Gate Valve differs from all others in that it has Parallel Seats, Double Revolving Gate Discs and Compound Equalizing Wedges. The Wedging Mechanism operates between the Gate Discs and independent of them.



**Sectional View of Inside Screw Valve  
with Flanged Ends**

## JENKINS BROS.

80 WHITE ST., NEW YORK

524 ATLANTIC AVE., BOSTON

133 NO. SEVENTH ST., PHILADELPHIA

300 W. LAKE ST., CHICAGO

JENKINS BROS., LIMITED

103 St. Remi St., Montreal

95 Queen Victoria St., London, E. C.

JENKINS RUBBER CO., ELIZABETH, N. J.

### MANUFACTURERS OF JENKINS BROS. VALVES PACKING AND OTHER MECHANICAL RUBBER GOODS



Fig. 105  
Sectional view of  
Brass Globe Valve  
Standard Pattern

#### JENKINS BROS. BRASS VALVES

Jenkins Bros. Brass Valves, Standard Pattern, are made in globe, angle, cross, check, safety, Y and radiator patterns.

They are the original renewable disc valves.

The Jenkins Discs, with which they are fitted, are of special rubber composition, readily adapting themselves to the raised seats ensuring absolutely tight closure. As there is no metal-against-metal contact of seats, there is less abrasion and wear, and the labor of regrinding is obviated. Jenkins Discs are inexpensive, give long service, and when worn out can be readily renewed without removal of valves from piping. As regularly supplied, valves are fitted with discs of hard composition for steam service. For cold water, air or gas, discs of softer composition are recommended. The valves are guaranteed for working steam pressures up to 150 pounds.

#### JENKINS BROS. IRON BODY VALVES

Jenkins Bros. Iron Body Valves, Standard Pattern, are made in globe, angle, cross, check, Y, safety and back pressure patterns. They are heavy and strong. The working parts are similar in construction to the standard pattern brass valves, and they are regularly fitted with Jenkins composition discs. All parts, including raised seat, are interchangeable and renewable. Guaranteed for working steam pressures up to 150 pounds.

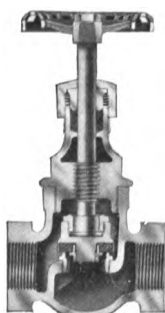


Fig. 128  
Sectional view of  
Brass Globe Valve  
Extra Heavy Pattern

#### JENKINS BROS. EXTRA HEAVY VALVES

Jenkins Bros. Extra Heavy Valves are designed for 250 pounds working pressure. The Globe, Angle and "Y" or Blow-off Valves are made in brass, either screwed or flanged, sizes  $\frac{1}{4}$  to 3 inches, and iron body 2 to 12 inches inclusive. The valves are well designed, made of the very best steam metals, and great care is taken with the workmanship.

The spindles are large and have powerful Acme standard threads.

The stuffing boxes are also large and arranged so that they can be packed under full pressure when wide open. They are fitted with renewable steam metal discs when used for steam, with Jenkins Discs for cold water service, and also have removable seat rings which can be reground or renewed when necessary.

A full line of Extra Heavy Horizontal, Angle and Swing Check Valves is also made equally heavy in design and can be recommended as being fully adapted to the service required.

As regularly made, all these Extra Heavy Valves are tested to 800 pounds hydraulic pressure. The factor of safety is so high, however, that the test pressure can be increased to double this figure if required and the valves may be safely used on hydraulic or air pressures up to 800 pounds.

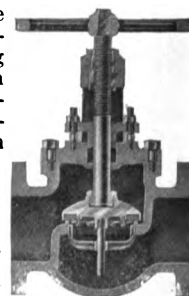


Fig. 162  
Sectional view of  
Iron Body Globe  
Valve Extra Heavy  
Pattern



## JENKINS BROS.

### JENKINS BROS. EXTRA HEAVY AUTOMATIC EQUALIZING STOP AND CHECK VALVES

are designed to shut off, automatically, the flow of steam from the header to a boiler in case a tube should burst or other internal rupture occur, thereby suddenly reducing the pressure in the boiler. They also serve to equalize the pressure in a battery of boilers and prevent one boiler from working at a lower pressure than the others. As the valves can only be opened by the pressure in the boiler it is impossible to turn steam accidentally into a boiler which is being cleaned. To prevent chattering, the valve is cushioned by an internal dashpot made of bronze which eliminates all danger of sticking through corrosion.

Each valve is carefully tested to 800 pounds hydraulic pressure and is guaranteed for working steam pressures up to 250 pounds. The stuffing-boxes can be packed when valve is wide open under full pressure.

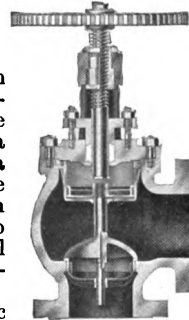


Fig. 293  
Sectional View of Automatic Stop and Check Valve, Angle Pattern

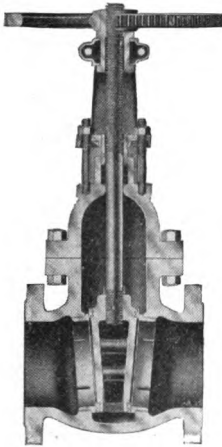


Fig. 245  
Sectional View of Extra Heavy Iron Body Gate with Outside Screw and Yoke

### JENKINS BROS. GATE VALVES

are a comparatively new, and distinctly high grade line. They are made in brass or iron body in three distinct patterns: Standard, for 125 pounds working steam pressure, or 175 pounds water; Medium, for 175 pounds steam or 250 pounds water; Extra Heavy, for 250 pounds steam or 400 pounds water.

They are all of the solid-wedge, double-face type. The wedge or gate is guided by ribs cast on the inside of the body, which fit in corresponding channels in the wedges, thereby preventing the wedge from dragging across the seat, preventing uneven wear on the faces, or chattering when valve is partly open.

One of the important features of these valves is the improved globe shaped body, a novel design which is used because it secures the greatest possible strength, good proportion and neat appearance.

The brass valves are regularly made in sizes  $\frac{1}{4}$  to 3 inches. Larger sizes in brass can be made from iron body patterns. Standard Iron Body Valves made in sizes 2 to 30 inches; Medium up to 18 inches; Extra Heavy up to 24 inches.

### JENKINS BROS. CAST STEEL VALVES

are made in Globe, Angle, Gate and Check Patterns, which experience has shown are perfectly adapted for the severe conditions incident to high pressure superheated steam service. The steel used in these valves is made in a modern converter from selected irons and for strength, ductility and soundness the castings are fully equal to those produced commercially by any known process.

For seat-rings, discs, bushings, and spindles Monel Metal is used, a natural alloy containing about 70 per cent nickel. The tensile strength is high, it is very hard, durable and non-corrosive and expands and contracts practically the same as cast steel. Seat-rings made of this metal do not get loose under the most severe conditions.

The valves are suitable for working steam pressures up to 350 pounds, and total temperature of 800° F.

All the genuine Jenkins Bros. Valves bear the Diamond Trade Mark, and are absolutely guaranteed to be perfect in workmanship and suitable and efficient in the service for which they are designed.

A catalogue of all the Jenkins Bros. products, giving sizes, styles and list prices mailed on request.

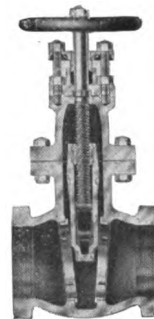


Fig. 250  
Sectional View of Iron Body Gate, Inside Screw

## THE KELLY & JONES CO.

GREENSBURG, PA.

**MANUFACTURERS OF BRASS AND IRON PIPE FITTINGS, BRASS AND IRON VALVES, COCKS, ETC., FOR STEAM, GAS, WATER, AIR AND OIL.**



Cast Iron Fittings

### CAST IRON FITTINGS

All styles, screwed or flanged for all pressures.

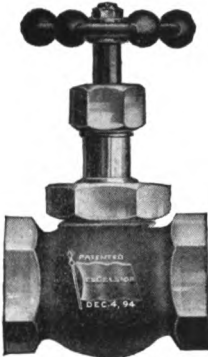
All K. & J. cast iron fittings are made of the best grade iron, threads cut true to standard gauge and each fitting recessed.



Malleable Fittings

### MALLEABLE FITTINGS

All styles—for all pressures. Plain or flat band.



"Excelsior" Valves  
Brass—High Pressure

### BRASS FITTINGS

Screwed or flanged, rough or finished—standard or extra heavy.

### DRAINAGE FITTINGS

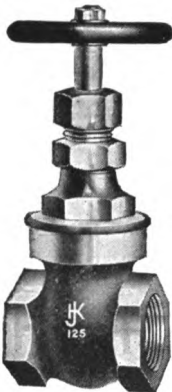
Our line of special recessed fittings for wrought iron drainage systems has been in satisfactory use for years.



Jenkins Disc Brass  
Valves

### BRASS VALVES

We make a brass valve for every purpose and each valve a perfect product. Only the best grades of raw material used and each valve thoroughly tested to pressure recommended.



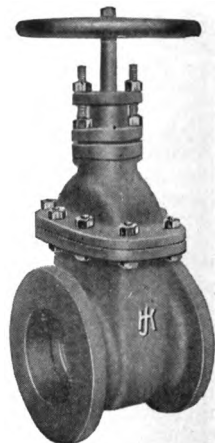
Brass Wedge Gate  
Valves

### IRON BODY VALVES

Our line of iron body valves is most complete. We make every style and for all pressures.

### CATALOGUE

We have just issued a new edition, 444 pages, designated Catalogue "M," and will be pleased to forward a copy upon request.



Iron Body Wedge Gate  
Valves

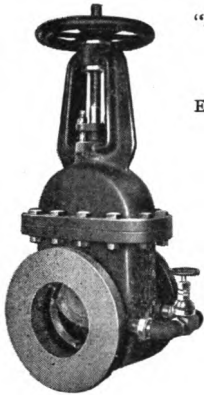


# THE KENNEDY VALVE MFG. CO.

Main Office and Works  
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AGENCIES:  
57 Beekman St., New York City      602 Western Union Bldg., Chicago  
415 French Savings Bank Bldg., San Francisco      604 Canal-Louisiana Bank Bldg., New Orleans

GATE, GLOBE, ANGLE,  
CHECK, RADIATOR AND  
INDICATOR } VALVES FOR { POWER, HEATING,  
FIRE PROTECTION  
WATER SUPPLY ETC.  
FIRE HYDRANTS



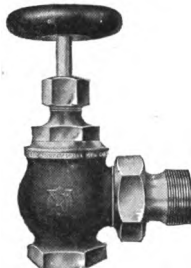
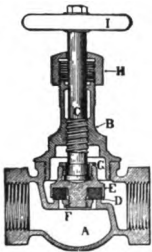
"Lenticular"  
Medium  
Heavy  
and  
Extra Heavy  
Gate  
Valves



"Standard"  
Bronze  
Gate  
Valve



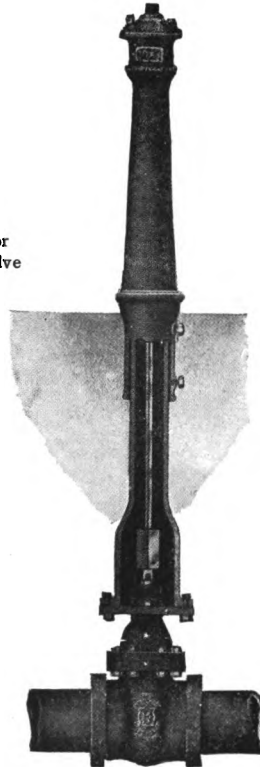
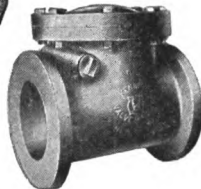
Globe and Radiator Valves  
with  
Goodrich  
Elastic  
Renewable  
Disc



Indicator  
Post Valve



Swinging  
Check  
Valves



Write for recently issued catalogue describing all the above  
and many other kinds of valves.

# THE LUDLOW VALVE MFG. CO.

TROY, NEW YORK

## BRANCH OFFICES

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BOSTON, Mass.: Oliver Bldg.

PITTSBURGH, Pa.: First Natl. Bank Bldg.

CHICAGO, ILL.: 633-635 The Rookery

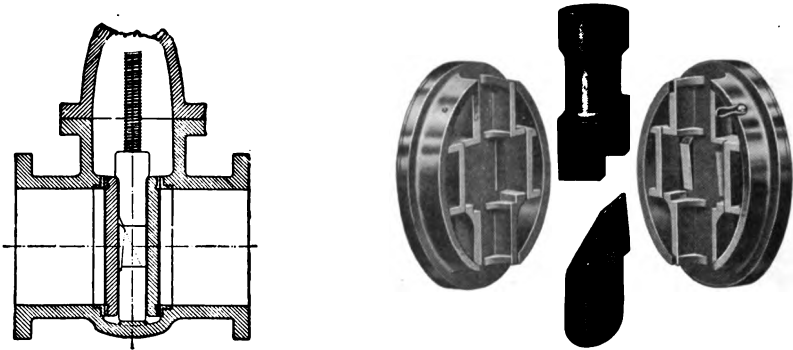
PHILADELPHIA, Pa.: Harrison Bldg.

KANSAS CITY, Mo.: Victor Bldg.

**HIGH GRADE VALVES FOR EVERY PURPOSE; VALVES FOR STEAM, WATER, OIL, GAS AND AMMONIA, OF ANY SIZE AND FOR ALL PRESSURES; AUTOMATIC AIR VALVES AND FLOAT VALVES; RELIEF VALVES; SLUICE GATES; CHECK AND FOOT VALVES; COMBINATION AIR VALVE WITH CONTROLLING GATE; HYDRANTS.**

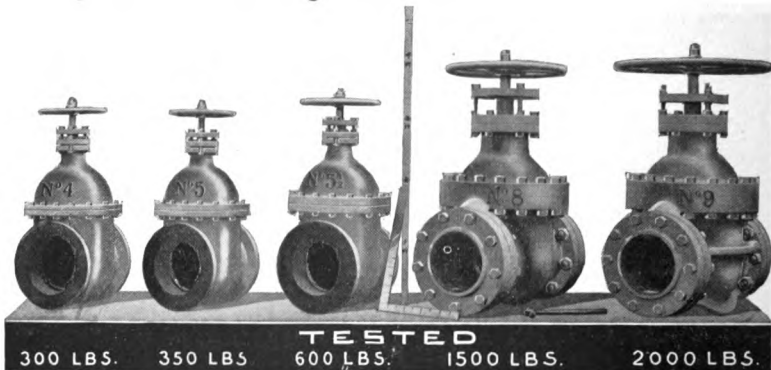
## THE LUDLOW DOUBLE GATE VALVE

The internal mechanism of valve consists of the stem, two gates and two beveled-faced wedges, the wedges being entirely independent of the gates (or discs) and working between them.



The illustrations show section of valve and detailed view of the Gates and Wedges. The Gates cannot lock or wedge in closing until directly opposite the ports. Gates are released from seats before starting to rise, avoiding wear on seats, and grinding or dragging of faces of gates on seats is impossible. Stem cannot bind or wedge. The gates cannot cant to either side and cause stripping of threads on stem.

Ludlow Double Gate Valves are made for all pressures and work equally well with the pressure either side of gate.



These Valves all have a 10" opening



## THE LUNKENHEIMER CO.

CINCINNATI, OHIO

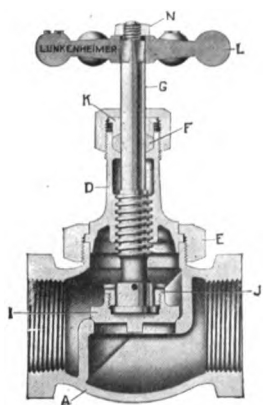
BRONZE, IRON, SEMI-STEEL AND CAST STEEL VALVES, WATER COLUMNS AND GAUGES, WHISTLES, GROUND KEY WORK, INJECTORS AND EJECTORS, LUBRICATORS, OIL PUMPS, OIL AND GREASE CUPS, MOTOR ACCESSORIES, ETC.

### LUNKENHEIMER REGRINDING VALVES

#### Bronze

Globe, Angle or Cross Patterns, with Inside Screw or Outside Screw and Yoke; Screw or Flange Ends; Medium weight for working steam pressures up to 200 pounds, and Extra Heavy for 300 pounds. Sizes of Inside Screw Pattern range from  $\frac{1}{4}$  to 4 inches inclusive, and Outside Screw and Yoke Pattern from  $1\frac{1}{2}$  to 8 inches inclusive.

Seating faces easily and quickly reground without disconnecting from pipe; discs and all other parts renewable; repackable under pressure when wide open. Original Lunkenheim union connection between body and hub on Inside Screw Pattern protects the uniting threads from the deteriorating action of the steam, and strengthens the neck of the body. Stuffing boxes furnished with gland follower on all sizes, with the exception of  $\frac{1}{8}$ ,  $\frac{1}{4}$ ,  $\frac{3}{8}$  and  $\frac{1}{2}$  inch. Smallest area through the bodies in excess of that of connecting pipe.



Inside Screw Pattern

### LUNKENHEIMER "RENEWO" VALVES

#### Bronze

Globe, Angle or Cross Patterns with Inside Screw or Outside Screw and Yoke; Screw or Flange Ends; Medium weight for working steam pressures up to 200 pounds, and Extra Heavy for 300 pounds; sizes of Inside Screw Pattern range from  $\frac{1}{4}$  to 3 inches inclusive, and Outside Screw and Yoke Pattern from  $1\frac{1}{2}$  to 3 inches inclusive.

Lunkenheimer "Seat-guard," the tubular extension on the bottom of the disc, assists in performing the following functions: 1st, Prevention of wire-drawing between the seating faces, and 2d, Prevention of scale and grit flowing over or lodging on the seating faces when the valve is being closed.

The performance of these functions tends to insure clean and tight seating surfaces before valve is closed, thereby prolonging their life.

All parts are renewable, including the seat and disc.

Seating faces can often be reground.

Seat and Disc are made of Lunkenheimer High-nickel Alloy.

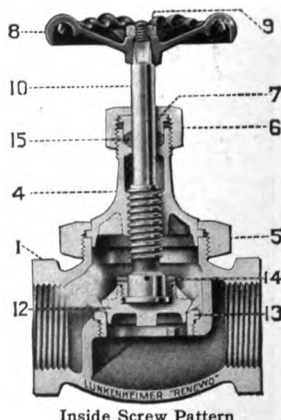
Stuffing-boxes furnished with gland follower on all sizes excepting the  $\frac{1}{4}$ ,  $\frac{3}{8}$  and  $\frac{1}{2}$ -inch. Repackable under pressure.

Original Lunkenheimer union connection between body and hub on Inside Screw Pattern protects the uniting threads from the deteriorating action of the steam, and strengthens the neck of the body.

Smallest areas through body larger than that of connecting pipe.

Self-cooling handwheel furnished on Inside Screw Pattern, sizes  $\frac{1}{4}$  to 2 inches inclusive.

*Write for Lunkenheimer Catalogue, fully descriptive of complete line.*

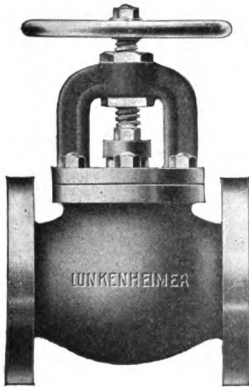


Inside Screw Pattern

# THE LUNKENHEIMER CO.

CINCINNATI, OHIO

## LUNKENHEIMER IRON BODY BRONZE MOUNTED "PUDDLED" SEMI-STEEL AND CAST STEEL GLOBE, ANGLE AND CROSS VALVES



Iron Body Bronze Mounted Globe Valve without By-pass

Iron Body Bronze Mounted Valves made in Medium Pattern for working steam pressures up to 125 pounds per square inch; Heavy Pattern for 175 pounds and Extra Heavy for 250 pounds.

"Puddled" Semi-steel Valves for high pressures, severe service and superheated steam are made in two combinations to suit various conditions of superheat, and meet the demands of engineers who differ as to the compositions of material used. Guaranteed for working steam pressures up to 250 pounds.

Cast Steel Valves for extreme conditions of service, pressure and superheat, are also made in two combinations: A, for 350 pounds working steam pressure, and B, for 300 pounds.

All of the above are furnished in sizes from 2 to 10 inches inclusive without By-pass, and from 5 to 12 inches with Interior or Exterior By-pass.

Seating-faces of both main and by-pass valves are regrindable.

All parts are renewable.

## LUNKENHEIMER IRON BODY BRONZE MOUNTED AND "PUDDLED" SEMI-STEEL CHECK VALVES

Iron Body Bronze Mounted Valves made in Medium Pattern for working steam pressures up to 125 pounds, Heavy Pattern for 175 pounds, and Extra Heavy for 250 pounds.

"Puddled" Semi-steel Valves are guaranteed for pressures up to 250 pounds.

Horizontal and Angle Patterns made in sizes from 2 to 12 inches inclusive, and Swing Check in sizes from 2 to 8 inches inclusive.

Seating-faces are regrindable.

All parts subjected to wear are renewable.

Discs well guided and will seat perfectly.

Swing Check Valves are provided with two renewable side plugs, the removal of either one of which enables the removal of all parts.

*Write for Lunkensheimer Catalogue, fully descriptive of complete line.*



Iron Body Bronze Mounted Swing Check Valve

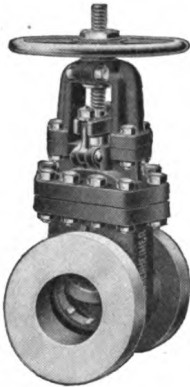
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(Continued from preceding pages)

## THE LUNKENHEIMER CO.

CINCINNATI, OHIO

### LUNKENHEIMER IRON BODY BRONZE MOUNTED "PUDDLED" SEMI-STEEL AND CAST STEEL "VICTOR" GATE VALVES



Iron Body Bronze Mounted "Victor" Gate Valve with Outside Screw and Yoke

Iron Body Bronze Mounted Valves made in Standard Pattern, sizes 2 to 8 inches inclusive, for working steam pressures below 125 pounds; sizes above 8 inches for pressures up to 100 pounds. Medium Pattern for pressures up to 125 pounds; without By-pass in sizes from 2 to 24 inches; with By-pass in sizes from 5 to 24 inches. Heavy Pattern for pressures up to 175 pounds; without By-pass in sizes 2 to 24 inches; with By-pass in sizes 5 to 24 inches. Extra Heavy Pattern for pressures up to 250 pounds; without By-pass in sizes from 1½ to 16 inches; with By-pass in sizes from 5 to 16 inches.

"Puddled" Semi-steel Valves, for pressures up to 250 pounds, and Cast Steel up to 350 pounds, are made in same sizes as Extra Heavy Iron Pattern.

Seats, disc and all other parts subjected to wear are renewable.

Double-seated, and pressure can be taken from either end.

Main and By-pass valves can be repacked under pressure.

By-pass valve seating faces can be reground.

### LUNKENHEIMER NON-RETURN SAFETY BOILER STOP VALVES

Iron Body Bronze Mounted; "Puddled" Semi-steel and Cast Steel.

Made in sizes from 4 to 10 inches inclusive, and in five different combinations as regards the body and trimmings, to suit various conditions of superheat and high pressures and to meet the specifications of engineers who differ as to what is best suited to the purpose.

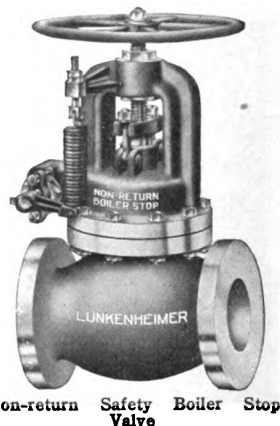
Valves will immediately close in case of a sudden decrease in pressure on the boiler side of the disc, which may be caused by the blowing out of a tube in the boiler or any rupture of the headers, shell, etc.

Construction eliminates vibration or chattering of the disc.

Valves cannot be opened by hand, but can be so closed.

All parts subjected to wear are renewable.

*Write for Lunkenheimer Catalogue, fully descriptive of complete line.*



Non-return Safety Boiler Stop Valve

# THE LUNKENHEIMER CO.

CINCINNATI, OHIO

---

## LUNKENHEIMER BRONZE

Lunkenheimer Bronze has a tensile strength averaging 34,000 pounds per square inch.

All parts exposed to steam are made of Lunkenheimer original and genuine steam bronze. Other parts are made of an alloy particularly adapted to meet the conditions under which they operate.

Alloys have sufficient tin to insure strength and hardness in order to resist wear.

Smallest amount of lead only is used,—about  $1\frac{1}{2}$  per cent and never over 2 per cent.

## LUNKENHEIMER CAST IRON

Careful regulation of the quantity of phosphorus, sulphur and silicon in Lunkenheimer Cast Iron enables the production of a metal of close grain and great strength.

This iron will stand a test of 25,000 pounds per square inch.

The very best grade of pig iron enters into the construction of Lunkenheimer Products, and new material only is used.

## LUNKENHEIMER "PUDDLED" SEMI-STEEL

The "Puddled" Semi-steel used in Lunkenheimer Valves is an extremely high grade iron and steel alloy of very close grain and great strength.

Tensile strength is 35,000 pounds per square inch.

Method employed is to melt the iron and steel together in a specially modified "puddling" furnace.

Best grade of Lake Superior Charcoal Iron is used.

Percentage of deleterious chemical elements is kept very low, a result which is absolutely impossible to obtain in any cupola.

## LUNKENHEIMER CAST STEEL

Made of Crucible Cast Steel and not Open Hearth or Converter Steel.

Melted in closed crucibles,—consequently the metal is not exposed to furnace gases.

Solid castings, free from blow-holes are assured.

Only castings made to meet standard specifications, and the only steel castings that contain less than .05 per cent of either phosphorus or sulphur.

All Lunkenheimer steel castings are annealed, thereby relieving internal stress and making fine crystalline grains, which are very essential to strong steel.

Tensile strength about 80,000 pounds per square inch, with a safe elastic limit and excellent elongation.

*Write for Lunkenheimer Catalogue, fully descriptive of complete line.*

## McNAB & HARLIN MFG. CO.

EXECUTIVE OFFICES, 55 JOHN STREET, NEW YORK CITY

Established 1854

Factory, PATERSON, N. J.

**BRASS, IRON AND STEEL FITTINGS, VALVES, COCKS, PIPE, ETC.,  
FOR STEAM, WATER AND GAS.**

### CAST IRON FITTINGS—SCREWED



"MH" Fittings are made of the best quality grey iron and threaded to Briggs Standard Gauge. We have a complete line of patterns for all styles, in both Standard and Extra Heavy.

In addition to our full line of steam fittings, we have a complete line of patterns for Drainage Fittings, and Long Turn Fittings, screwed and flanged, particularly adapted to Sprinkler Work.

### CAST IRON FITTINGS—FLANGED

We carry a very large and complete stock of both Standard and High-Pressure Flanged Fittings, in all styles and sizes, and are in a position to furnish these goods, which are designed for high grade power plant installation, on very short notice.



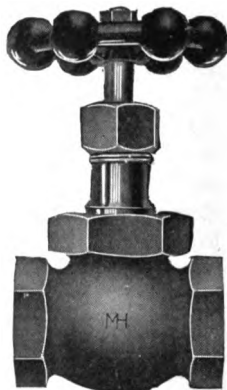
### BRASS FITTINGS



"MH" Brass Fittings are made from a standard composition, best suited for this class of work. Having a complete line of patterns for both Flanged and Screwed, we are in a position to furnish these Fittings from the Malleable and the Cast Iron patterns very promptly.

### JENKINS DISC STEAM METAL VALVES

In addition to our full line of Hard-seat Valves, we have a full line of patterns for Jenkins Disc Steam Metal Valves: Globe, Angle, Horizontal, Vertical and Angle Check Valves. All parts of these Valves are interchangeable with Jenkins Bros. Valves. These Valves regularly are furnished with the composition discs, but can be furnished with special soft-rubber discs for Air and Cold Water, or with a metallic disc when conditions require same.



### "MH" REGRINDING VALVES

We solicit your inquiries for a trial order for "MH" Regrinding Valves. These Valves are made of a very high quality Steam Metal, selected after careful study and chemical and physical tests, to give the most satisfactory service. We have patterns for a complete line of these Valves, which are good for 200 pounds steam pressure and are all thoroughly tested before leaving our factory. We recommend them to give perfect satisfaction where conditions require a Valve of superior quality.



### STEEL VALVES AND FITTINGS

To meet the requirements of the Engineering Trade, we have added to our extensive line of high grade "MH" goods, Steel Valves and Fittings, that are especially adapted for power plant and superheated steam work.

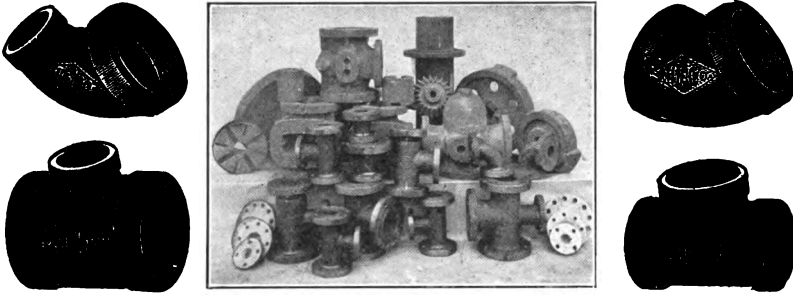


## **MALLEABLE IRON FITTINGS CO.**

INCORPORATED 1864

BRANFORD, CONN.

**MANUFACTURERS OF MALLEABLE IRON PIPE FITTINGS for Gas, Steam and Water; STEEL FITTINGS for High Pressure Service; AIR FURNACE REFINED MALLEABLE IRON AND SEMI-STEEL CASTINGS; CARBON AND ALLOY STEEL CASTINGS**



### **EXTRA HEAVY FLANGES**

**For High Pressure Requirements**

For Rolled, Shrunk or Welded Connection, bored, countersunk, grooved, faced and drilled to specification.

### **HIGH PRESSURE FITTINGS**

**Standard Sizes in Stock in Steel or Malleable**

**Machined, tested and ready for the line.**

Specials made to order for railroad, manufacturing, mining, and municipal power plants in compliance with Lloyds Rules or Regulations of the U. S. Steam-boat Inspection Service.

### **MALLEABLE IRON AND SEMI-STEEL CASTINGS**

For Machinery; Automobile; Gun; Sewing-Machine; Overhead, Third-Rail, Underground Electrical Construction and all miscellaneous work.

### **LOW CARBON STEEL CASTINGS**

**Better than Open Hearth—Equal to Crucible**

### **SPECIAL METAL "A"**

For Gears and Cams where resistance is wanted. May be heat treated to required hardness.

### **AIR FURNACE REFINED VANADIUM GREY IRON**

For Piston Heads, Piston Rings, and Cylinders. Has a high tensility and is tough, sound, and dense.

### **CUSTOM AND JOBBING DEPARTMENT**

Galvanizing, Tinning, Japanning. Contract Machining of Malleable Iron, Grey Iron, Wrought Iron, and Steel. Galvanized Nails—Marine Hardware.

## **PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.**

**PITTSBURGH, PA.**

**ENGINEERS, MANUFACTURERS AND ERECTORS**

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Denver, Colo., Vaughan Machinery Co., 1710  
Glenarm St.

Philadelphia, Pa., Charles H. Whitney & Co.,  
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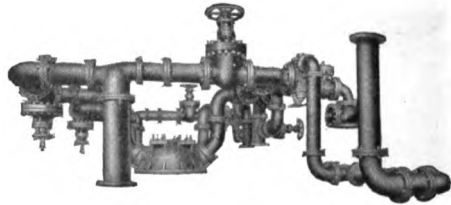
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Valves, Fittings and Appliances of every description for Steam, Gas, Water, Air and Hydraulic Piping. Complete piping contracts executed—designed by experienced engineers, manufactured by skilled workmen under intelligent supervision and erected by expert fitters.



**Piping for Panama Canal Chain Fender Pits**

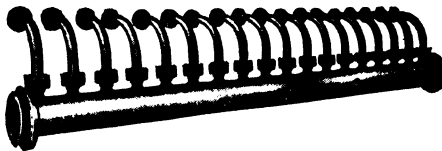


**6'-0" x 6'-6"  
Sluice Gate**

Special Valves and Sluice Gates for hydraulic installations, Motor Operated and Cylinder Operated. Hydraulic Operating Valves for blast furnace doors and bells, and for steel mill tables and rolls.

Special facilities for casting and machining large pipe, fittings, furnace castings, etc.

Pipe cutting, bending and welding. Branches and manifold outlets fabricated by the patented Interlock Method.



**16" Welded Header with 16-4" Branches**

# PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

## STANDARD LINES OF GATE VALVES

**SPECIFICATIONS FOR MATERIAL** Grey Iron—22,000 lb. per sq. in. tensile strength.

Semi Steel—33,000 lb. per sq. in. tensile strength.

**PARALLEL SEAT 50 lb. WORKING PRESSURE 100 lb. TEST PRESSURE** Sizes 14" to 72" cast iron. Low pressure. For water, gas, air or exhaust steam. Extremely close face to face, invaluable in complicated piping connections.

**PARALLEL SEAT 125 lb. WORKING PRESSURE 300 lb. TEST PRESSURE** Sizes 2" to 48" cast iron. Standard pressure. For water, air, steam or gas. Fully bronze mounted. Especially adapted to water distribution.

**PARALLEL SEAT 200 lb. WORKING PRESSURE 400 lb. TEST PRESSURE** Sizes 1½" to 16" cast iron. Largely used for natural gas under the lower pressures. Furnished either all iron or iron body bronze mounted.

**PARALLEL SEAT 400 lb. WORKING PRESSURE 800 lb. TEST PRESSURE** Sizes 3" to 20" semi steel. In extensive use for the transmission of natural gas. Furnished either with or without bronze mountings.

**PARALLEL SEAT 500 lb. WORKING PRESSURE 1500 lb. TEST PRESSURE** Sizes 2" to 12". For water or oil at pressure noted. Semi steel with solid bronze mountings.

**PARALLEL SEAT 1000 lb. WORKING PRESSURE 1500 lb. TEST PRESSURE** Sizes 2" to 12" semi steel. High pressure gas valve used chiefly at the gas wells and on feeders in the gas fields.

**PARALLEL SEAT 1500 lb. WORKING PRESSURE 2000 lb. TEST PRESSURE** Sizes 2" to 10" semi steel. For hydraulic service and extreme natural gas rock pressures.

**TAPER SEAT 175 lb. WORKING PRESSURE 500 lb. TEST PRESSURE** Sizes 2" to 16" semi steel. A valve for medium steam pressures from 125 lb. to 175 lb. where a less expensive valve than the 250 lb. type is desired.

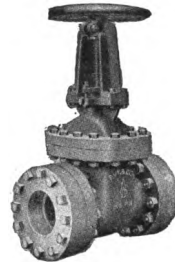
**TAPER SEAT 250 lb. WORKING PRESSURE 800 lb. TEST PRESSURE** Sizes 1½" to 28" Made of semi steel with solid bronze mountings for ordinary steam pressures or of cast steel with monel mountings for superheat.

**TAPER SEAT 1000 lb. WORKING PRESSURE 2000 lb. TEST PRESSURE** Sizes 2" to 10". The strongest valve possible to make in its weight, all surfaces being cylindrical or spherical segments.

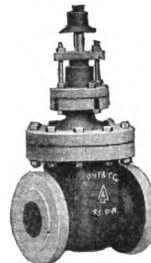
**GATE VALVES FOR ANY PRESSURE** Designs and quotations furnished for valves for special conditions or higher pressures. Materials used are those best adapted to service.



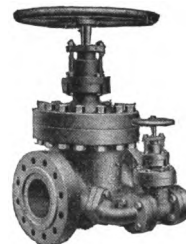
50 lb. Parallel Seat Gate Valve. Close Pattern



8" 500 lb. Gate Valve



4" 1000 lb. Gas Line Gate Valve

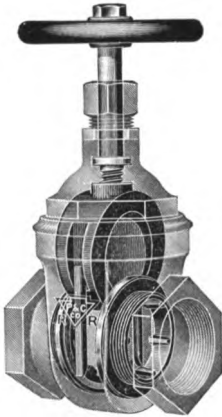


8" 1000 lb. Hydraulic Gate Valve

## PRATT AND CADY CO., INC.

HARTFORD, CONN.

VALVES, COCKS AND HYDRANTS



Renewable Seat Gate Valve

### RENEWABLE SEAT GATE VALVES

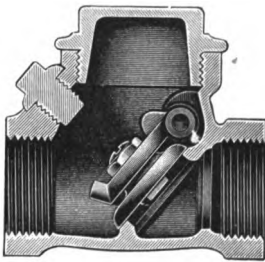
#### Brass and Iron

All styles for all pressures. Sizes up to 24 inches. With renewable seat rings, held in place by separate retaining rings easily removable.

The seat rings are independent rings of bronze, or any special metal or material best adapted for the service in which the valve is to be used. The gate is a double faced, wedge shaped casting, with side grooves by means of which it slides on guides in the valve body.

Gauges are used in machining all parts to insure their accuracy and interchangeability.

The guides in our bodies are of equal thickness, and the wedge can be taken out of the valve and replaced with the opposite faces in contact, and will give an accurate fit. The importance of this in making repairs is obvious. These valves being double seated, can be used with the pressure applied at either end.



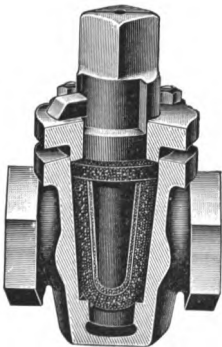
Regrinding Swing Check Valve

### REGRINDING SWING CHECK VALVES

#### Brass and Iron

All styles for all pressures, sizes up to 36 inches.

The design combines pressure resistance with easy flow lines. Material (of brass valves) is 86% pure copper. Each valve is tested to an adequate pressure. All seats are carefully ground. Assembling is done by expert mechanics. The interior construction permits the replacement of any working part without removing valve from line. For regrinding no tool is necessary but a wrench and brace and bit.



Asbestos-Packed Cock

### ASBESTOS-PACKED COCKS

#### Brass and Iron

Made in sizes  $\frac{1}{8}$  inch to 8 inches, for all pressures.

The dovetailed, U-shaped grooves in the body are packed with prepared asbestos. An asbestos ring is used on the shoulder of the plug for top packing.

The plug is of standard taper carefully finished and barbed to render it rustless. It has no metallic bearing, coming in contact only with asbestos, the elasticity of which compensates for the differential expansion and contraction of the plug and body. The gland admits of adjustment by means of its bolts.

These cocks give exceedingly satisfactory results as boiler blow-offs and water column blow-offs, between check and boiler, between water column and boiler, and they do work where ground plug cocks, globe, angle or gate valves fail.

## PRATT AND CADY CO., INC. HARTFORD, CONN.

### ASBESTOS DISC GLOBE AND ANGLE VALVES

Made in sizes  $\frac{1}{8}$  inch to 3 inches.

The stuffing box gland is long, heavy and well fitted.

The spindle collar, and its point of contact with the bonnet, have specially smooth surfaces and make a steam-tight joint when valve is fully open.

The disc holder is guided by four splines in the body, assuring perfect alignment at all times. The disc holder is of the horseshoe type, and can be removed and replaced, the only tool necessary therefor being a wrench to unscrew the bonnet.

The seat is spherical, thus preventing the settling thereon of any substance that might hold the disc from going squarely to its place. The bronze in these valves is approximately 86% pure copper.

### CAST STEEL GATE VALVES FOR SUPER-HEATED STEAM

All tested to a hydrostatic pressure of 800 lbs., suitable for 250 pounds pressure and 200 degrees superheat.

All valves  $2\frac{1}{2}$ " to  $4\frac{1}{2}$ " are equipped with cast steel bodies, bonnets, yokes and nickel-bronze wedges.

Valves 5 inches to 16 inches have cast steel wedges.

The seats and faces of the wedges are made of nickel-bronze, securely fastened in place so that they cannot work loose.

Stems are cold rolled steel.

All bolt holes are spot faced.

Bonnet joint is packed with the best grade of super-heat packing.

The end flanges have  $\frac{1}{8}$ " raised faces, extending full width inside of bolt holes, with smooth finish.

All bolts have hexagon heads and nuts, with their under sides semi-finished.

The discs can be furnished either split or solid wedge pattern.

Stuffing box is made with hinge bolts, very deep for square packing.

### TRIPLE-DUTY EMERGENCY VALVES

This valve is essentially a safety device for the boiler room. Placed between the boiler and the header, it will act as an absolute preventive of dangerous accidents.

Its triple functions are:—

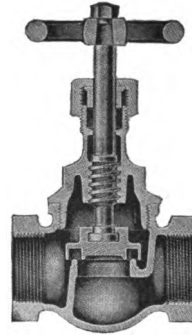
1. It may be used as a positive stop.
2. If the boiler pressure should become depressed suddenly through the bursting of a tube or any other cause, it will close automatically.
3. If the pressure in the header, through any cause, falls ten per cent below the boiler pressure, it will close automatically.

Remains open so long as the pressure below and above the piston are equal.

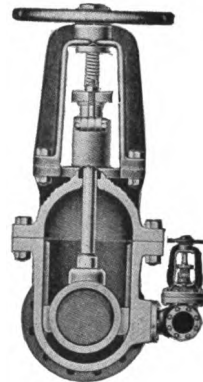
Simple in construction—Simple in principle of operation.

Made in iron body, bronze trimmed, in sizes 2" to 10" for 250 pounds working pressure.

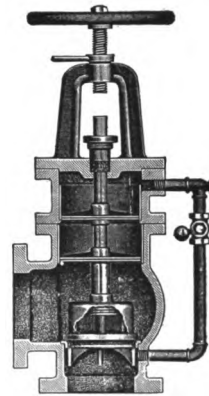
Made in steel with Monel metal trimmings in sizes 2" to 10" for 250 pounds working pressure and 200 degrees superheat.



Asbestos Disc Globe Valve



Cast Steel Gate Valve



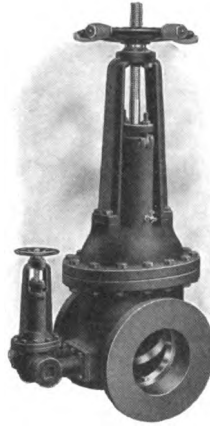
Triple Duty Emergency Valve

## JOHN SIMMONS CO.

110 CENTRE ST., NEW YORK

IRON PIPE, FITTINGS AND VALVES

---



In our New York City plant, in addition to a large and varied stock of material for STEAM ENGINEERING, including WROUGHT IRON and WROUGHT STEEL PIPE  $\frac{1}{8}$ " to 18" inclusive, we have a pipe cutting department with forty machines, cutting up to and including 18" and a fully equipped machine shop for all work connected with Steam Engineering.

We make continuous welded pipe coils, spiral, flat, round and return. Also return bend coils, made of standard or extra heavy pipe and fittings.

Bends of Wrought Iron Pipe  $\frac{1}{8}$ " to 24" in diameter, standard and extra heavy, made in all shapes and for all purposes. Also brass pipe bends.

Fittings, standard weight and extra heavy, cast iron, malleable iron and semi-steel of regular and special design, high and low pressure, screwed and flanged joints.

We carry in stock and make to order, all Standard Styles and Sizes of Valves, including globe, angle, cross, check and foot valves, made of brass, bronze, iron, and special alloy metals for acid work, all with screwed or flanged ends. Gate Valves in standard and special designs, for ordinary and extreme working pressure. Rothchild Blow-off Cock or Rotary Gate Valves.

## AMERICAN DISTRICT STEAM CO.

GENERAL OFFICES AND WORKS  
NORTH TONAWANDA, N. Y.

First Nat. Bank Bldg.  
CHICAGO

Hoge Building  
SEATTLE

**ENGINEERS AND CONTRACTORS; "CENTRAL STATION HEATING";  
EXAMINATIONS AND REPORTS; STEAM SPECIALTIES.**

### CENTRAL STATION HEATING SYSTEMS

UTILIZING THE EXHAUST STEAM FROM ELECTRIC LIGHT AND POWER PLANTS FOR HEATING STORES, OFFICES, PUBLIC BUILDINGS, SCHOOLS, CHURCHES, RESIDENCES, ETC.

Our extensive experience dating back to 1877, enables us to closely foretell the possible income from the utilization of exhaust steam, if used according to the plans of the American District Steam Heating System. Hundreds of Central Stations are now operating over 1000 miles of underground mains with our system. In many cases, they have found that the income from the installations of the American System is often more than enough to pay all the expenses of generating current. We gladly send our engineers to investigate conditions, estimate the cost and tell what results can be expected.

### STEAM SPECIALTIES

The following list gives the range of our activity in the manufacture of steam specialties:—

|  |                                    |
|--|------------------------------------|
| Steam Pipe Casing                                    | "Adscó" Graduated Receivers        |
| Single Expansion Variators                           | " Mercury Gauges                   |
| Double Expansion Variators                           | " Water Gauges                     |
| Standard Expansion Joints                            | " Water Heaters                    |
| Iron Body Expansion Joints, Single and Double        | Steam Meters, "pressure"           |
| Flanged Anchor Specials                              | Ball Joints                        |
| Special Flanged Fittings for Underground Steam Mains | Adjustable Annular Wedges          |
| Boosters   | Flanged 45° and 90° Angle Joints   |
| Standard Flanged Fittings                            | Steam Traps, high and low pressure |
| Reducing Companion Flanges                           | Separators                         |
| Companion Flanges                                    | Back Pressure Valves               |
| Long Sweep Cast Iron Fittings                        | Cast Iron Valve Curbs              |
| Cast Iron Fittings                                   | Packless Iron Body Gate Valves     |
| "Adscó" Graduated Radiator Valves                    | Iron Body Gate Valves              |
| " Damper Regulator and Relief Valve                  | Radiator Valves                    |
|  | Condensation Meters                |
|  | Reducing Valves                    |
|  | Wooden Water Pipe                  |

Send today for our Bulletins and Catalogues—They are free and explain fully.

# FOSTER ENGINEERING CO.

NEWARK, N. J.

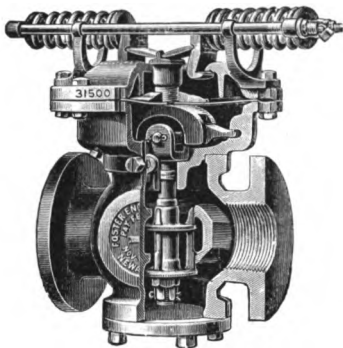
BRANCH OFFICES: CHICAGO, PHILADELPHIA, BOSTON, PITTSBURGH

MANUFACTURING ENGINEERS OF AUTOMATIC VALVE SPECIALTIES

## PRODUCTS

**PRESSURE REGULATORS** (Reducing Valves), **PUMP GOVERNORS** (different styles for different purposes), for steam, water, gas and air. **HYDRAULIC REGULATING** and **RELIEF VALVES**, for high and low pressures. **Automatic FREE EXHAUST** or **RELIEF VALVES**; **BACK PRESSURE VALVES**; **FAN ENGINE REGULATORS**, for controlling speed of fan by pressure in boiler. **LEVER BALANCED VALVES**; **FLOAT VALVES**, auxiliary-operated and direct-connected. **AUTOMATIC NON-RETURN STOP VALVES**; **AUTOMATIC NON-RETURN EMERGENCY STOP VALVES**, for saturated and superheated steam—semi-steel and cast steel bodies, and other kindred devices. Over 60 different styles. Also design valves for special services.

### PRESSURE REGULATOR—CLASS "W"



For maintaining a Constant Uniform Delivery Pressure from a Higher Initial Regardless of Variations in the Boiler Pressure or Source of Supply. For Service on Steam, Water, Gas and Air.

Its "compensating spring and toggle lever arrangement" makes it phenomenally sensitive, accurate and reliable. Has no weights, levers, or close-fitting piston or parts to cause friction. Very simple in construction and adjustment. Made in sizes  $\frac{1}{2}$ -inch to 1-inch of composition; larger sizes, iron body, composition mounted. Sizes  $2\frac{1}{2}$ -inch and up are fitted with *renewable seats* forged steel stem and levers—insuring *durability* and *minimum repairs*. Thousands are in use today in all civilized countries and is the "standard" of many large power and manufacturing plants.

### FOSTER CLASS "G" PRESSURE REGULATING VALVE FOR INTERMITTENT SERVICE

A decided innovation, so extremely sensitive and withal so reliable that delivery pressure may be adjusted from zero to within a fraction of the initial pressure, and at point of adjustment the delivery will remain constant regardless of variation in initial pressure or volume of discharge.

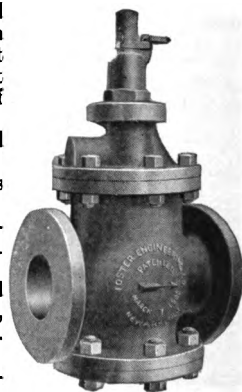
Will operate equally well on horizontal or vertical pipe; upright, inverted or inclined at any angle.

Although of wide range of operation, no part of this valve is of delicate construction or easily deranged.

Orders should state initial and delivery pressures, connections, service and approximate volume of discharge. (See below.)

Made in all sizes,  $\frac{1}{2}$ -inch to 12-inch. Sizes 2-inch and smaller of composition only. Larger sizes, iron body, composition trimmed. Screwed and flanged connections. Also make larger sizes in composition on order only.

Prices on application. Write for complete 1914 Catalogue No. 20.



### ORDERS FOR PRESSURE REGULATING VALVES SHOULD SPECIFY:

1. Initial or boiler pressure.
2. Maximum and minimum delivery pressure.
3. Connections—screwed or flanged ends, giving diameter.
4. Sizes of both pipes leading to and from regulator.
5. Device or system to which it is to be applied.
6. For high or low pressure service.
7. Size of valve preferred and if we will be permitted to send a smaller size if we deem a smaller valve will give better results. By following our suggestions we often save considerable money for our users.
8. Any additional information towards an intelligent understanding of your requirements will insure your receiving a valve best suited to meet conditions.



# JULIAN D'ESTE COMPANY

24 CANAL ST., BOSTON, MASS.

BRASS FOUNDERS, FINISHERS AND MACHINISTS. SOLE MANUFACTURERS OF CURTIS ENGINEERING SPECIALTIES, INCLUDING DAMPER REGULATORS, IMPROVED PRESSURE REGULATORS, IMPROVED PUMP REGULATORS, WATER PRESSURE REGULATORS, EXPANSION TRAP, RETURN STEAM TRAP, BALANCED STEAM TRAP, RELIEF VALVE FOR STEAM AND WATER, STEAM SEPARATOR, TEMPERATURE REGULATOR, PUMP GOVERNOR AND PUMP, BLOWER VALVE, CELLAR DRAINER, U. S. BALL COCK, ETC.

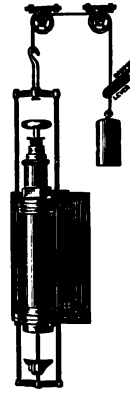
## THE CURTIS IMPROVED (PATENT) DAMPER REGULATORS

The plunger is operated by steam direct from the boiler, and the whole pressure in the boiler is therefore available to operate the damper if needed. In practice, only enough pressure is used to lift the weight, usually not more than ten pounds to the square inch on the plunger.

The motion of the damper will begin to change from one direction to the other on a variation of steam pressure of one half of a pound either way from the point at which it is set to operate.

We guarantee a saving of ten per cent of the fuel over the best hand regulation or the old style (diaphragm and lever regulator), and it often reaches fifteen per cent.

They are sent on thirty days' approval and will pay their cost by the saving of fuel in one year. Three Standard Sizes.



Damper Regulator

## IMPROVED STEAM PRESSURE REGULATORS

This regulator is made entirely of metal, occupies the same space as a globe valve for the same size pipe, and is very simple and sensitive.

By its use steam may be maintained at high pressure in boilers, and yet be reduced for heating to two or three pounds.

In the best engineering practice the exhaust steam of the engine and elevator is turned into the heating system of a building, and the Regulator automatically supplies just the amount lacking to maintain constant pressure in the pipes and radiators.

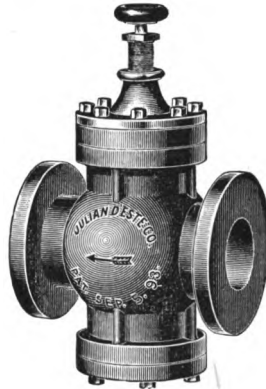
Standard sizes for 1, 1½, 2, 2½, 3, 4, 5, 6, 7, 8, 10, 12, 14, and 16 inch pipe.

A lockup top furnished at small additional cost.

## THE CURTIS BALANCED STEAM TRAP

Some Points of Superiority

1. A perfectly balanced valve.
2. An absolutely frictionless valve.
3. The valve can be removed without breaking a joint, starting a gasket, or taking out a bolt.
4. The valve being frictionless and balanced, the whole power of the float is available for opening and closing the valve.
5. The copper float is perfectly spherical, hard, as hermetically sealed as a glass globe, is of uniform thickness and warranted strong and tight at 250 lbs. pressure.
6. It has a pass-by valve to insure constant operation.
7. Each trap will operate perfectly on pressures varying from one to 250 pounds.

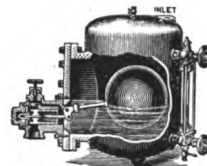


Steam Pressure Regulator

## PRICE LIST

Size and Condensing Capacity in Feet of One-Inch Pipe

|          |                        |                         |
|----------|------------------------|-------------------------|
| No. 000. | \$15.00 for 1,000 feet | ½ in. inlet and outlet  |
| No. 00.  | 20.00 for 2,000 feet   | ½ in. inlet and outlet  |
| No. 0.   | 25.00 for 3,000 feet   | ½ in. inlet and outlet  |
| No. 1.   | 30.00 for 5,000 feet   | ¾ in. inlet and outlet  |
| No. 2.   | 40.00 for 8,000 feet   | 1 in. inlet and outlet  |
| No. 2½.  | 55.00 for 15,000 feet  | 1¼ in. inlet and outlet |
| No. 3.   | 75.00 for 30,000 feet  | 1½ in. inlet and outlet |
| No. 4.   | 100.00 for 40,000 feet | 2 in. inlet and outlet  |
| No. 5.   | 125.00 for 60,000 feet | 3 in. inlet and outlet  |



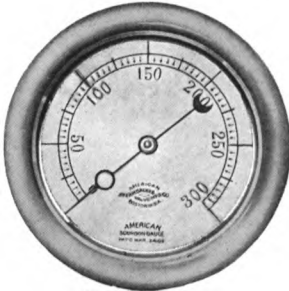
Balanced Steam Trap

## AMERICAN STEAM GAUGE & VALVE MANUFACTURING CO.

FACTORY AND GENERAL OFFICES, BOSTON, MASS.

SALES OFFICES: NEW YORK, CHICAGO, ATLANTA, PITTSBURGH

**MANUFACTURERS OF STEAM TRAPS, GAUGES, VALVES, INDICATORS, AND KINDRED APPLIANCES FOR GOVERNING, INDICATING, MEASURING, RECORDING AND CONTROLLING STEAM, WATER, AIR, GAS, OIL, AMMONIA, AND ALL OTHER PRESSURES.**



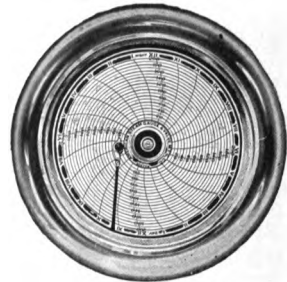
Bourdon Gauge

**AMERICAN GAUGES** are the simplest in construction, yet so designed that maximum efficiency with longest service is assured to the user. Gauges are too often judged or selected from superficial inspection only, with little or no attention to interior construction—the vital part. In American Gauges only the best material and workmanship will be found, as well as accuracy. This means dollars in every sense of the word to the owner, in both operating and maintenance expense. We furnish gauges for every purpose, and especially invite inquiries for installations where operating

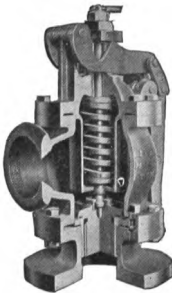
conditions are unusually severe. Estimates promptly furnished.

### AMERICAN RECORDING GAUGES

The economical operation of power is safely guarded by the use of accurate, durable Recording Gauges. American Recorders are constructed in the same reliable, workmanlike manner that is characteristic of all our products. The style of case is the same as our non-recording instruments, thus giving uniformity to gauge board installations. Highest grade clock movements are used, insuring accurate time records. Standard chart 8 inch, 24 hour. Special charts to order. Each gauge fitted with our improved fountain pen, requiring filling monthly. We specialize in engine room gauge boards complete, and invite inquiry.



Recording Gauge



Sectional View

### AMERICAN SPECIAL POP SAFETY VALVE

This valve is designed embodying the best features found in our experience during the thirty years of spring loaded safety valve existence. Constructed of the highest grade materials, tested under actual working conditions, simple, efficient, and of few working parts, all being easily accessible, and *all* adjustments made from *outside* valve casing. It is the best in valve construction.

This valve is also made in outside spring pattern for superheated steam.

**OUR SIXTY-THREE YEARS' RECORD IS BEHIND OUR GUARANTEE COVERING ALL GOODS WHICH WE MANUFACTURE.**

# AMERICAN STEAM GAUGE & VALVE MANUFACTURING CO.

ESTABLISHED 1851

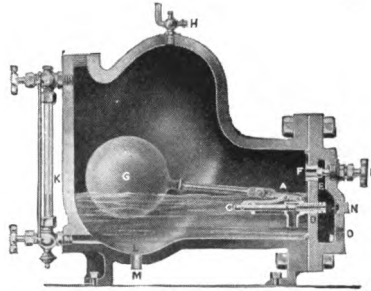
## AMERICAN IDEAL STEAM TRAP

The essential feature of this Trap is its valve leverage, which is many times more powerful than in any other Float Trap. This permits the use of floats sufficiently heavy to prevent possibility of collapse, and we make positive guarantee to this effect when traps are used on pressures for which they are intended.

Special attention is called to the following table giving rated capacities for pressures 1 lb. to 30 lb., this rating in every case being under rather than over what the trap will actually do.

We are also prepared to furnish rated capacities for pressures 30 lb. to 250 lb. on application.

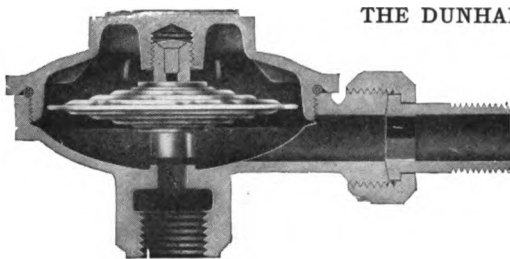
The features of construction of this trap, both as regards valve leverage and design of shell or casing, insure unusually low upkeep or maintenance, and absence of trouble in operation.



Model C—Sectional View

TABLE OF CAPACITIES—MODEL C—LOW PRESSURE

| Size Trap                        |                         | Pounds per Sq. Inch |        |        |        |        |        |        |        |         |
|----------------------------------|-------------------------|---------------------|--------|--------|--------|--------|--------|--------|--------|---------|
|                                  |                         | 3                   | 5      | 8      | 10     | 13     | 15     | 20     | 25     | 30      |
| No. 1 Trap<br>½ in.<br>Opening   | Gallons of water.....   | 405                 | 525    | 670    | 755    | 860    | 925    | 1,065  | 1,185  | 1,300   |
|                                  | Pounds of water.....    | 3,380               | 4,380  | 5,600  | 6,320  | 7,180  | 7,730  | 8,880  | 9,900  | 10,880  |
|                                  | Lineal ft. of 1" pipe.. | 6,000               | 7,780  | 9,950  | 11,220 | 12,750 | 13,720 | 15,780 | 17,600 | 19,300  |
|                                  | Sq. ft. of rad.....     | 2,000               | 2,590  | 3,320  | 3,740  | 4,235  | 4,570  | 5,260  | 5,870  | 6,430   |
| No. 2 Trap<br>¾ in.<br>Opening   | Gallons of water.....   | 610                 | 795    | 1,004  | 1,120  | 1,287  | 1,380  | 1,580  | 1,770  | 1,950   |
|                                  | Pounds of water.....    | 5,100               | 6,640  | 8,380  | 9,360  | 10,750 | 11,550 | 13,200 | 14,800 | 16,300  |
|                                  | Lineal ft. of 1" pipe.. | 9,050               | 11,600 | 14,900 | 16,650 | 19,100 | 20,500 | 23,470 | 26,300 | 29,000  |
|                                  | Sq. ft. of rad.....     | 3,010               | 3,870  | 4,970  | 5,550  | 6,375  | 6,830  | 7,820  | 8,770  | 9,660   |
| No. 3 Trap<br>1 in.<br>Opening   | Gallons of water.....   | 990                 | 1,260  | 1,623  | 1,810  | 2,074  | 2,230  | 2,580  | 2,880  | 3,150   |
|                                  | Pounds of water.....    | 8,270               | 10,530 | 13,550 | 15,120 | 17,320 | 18,600 | 21,550 | 24,100 | 26,300  |
|                                  | Lineal ft. of 1" pipe.. | 14,700              | 18,740 | 24,300 | 26,900 | 30,750 | 33,090 | 38,300 | 42,800 | 46,750  |
|                                  | Sq. ft. of rad.....     | 4,900               | 6,250  | 8,100  | 8,970  | 10,250 | 11,000 | 12,770 | 14,260 | 15,580  |
| No. 4 Trap<br>1 ¼ in.<br>Opening | Gallons of water.....   | 1,520               | 1,940  | 2,490  | 2,800  | 3,190  | 3,440  | 3,970  | 4,420  | 4,850   |
|                                  | Pounds of water.....    | 12,700              | 16,200 | 20,800 | 23,400 | 26,650 | 28,700 | 33,150 | 36,900 | 40,500  |
|                                  | Lineal ft. of 1" pipe.. | 22,600              | 28,800 | 36,900 | 41,650 | 47,300 | 51,000 | 59,000 | 65,650 | 72,000  |
|                                  | Sq. ft. of rad.....     | 7,530               | 9,600  | 12,300 | 13,880 | 15,760 | 17,000 | 19,660 | 21,880 | 24,000  |
| No. 5 Trap<br>1 ½ in.<br>Opening | Gallons of water.....   | 2,140               | 2,800  | 3,530  | 3,970  | 4,525  | 4,870  | 5,620  | 6,270  | 6,850   |
|                                  | Pounds of water.....    | 17,750              | 23,400 | 29,500 | 33,150 | 37,800 | 40,700 | 47,000 | 52,300 | 57,250  |
|                                  | Lineal ft. of 1" pipe.. | 31,550              | 41,650 | 52,400 | 59,000 | 67,150 | 72,700 | 83,500 | 93,000 | 102,000 |
|                                  | Sq. ft. of rad.....     | 10,510              | 13,880 | 17,450 | 19,660 | 22,380 | 24,280 | 27,830 | 31,000 | 34,000  |

**C. A. DUNHAM COMPANY****MARSHALLTOWN, IOWA**No. 1 Madison Ave.  
NEW YORK343 S. Dearborn St.  
CHICAGO611 Wells Fargo Bldg.  
SAN FRANCISCO**CANADIAN FACTORY AND OFFICE: TORONTO, ONTARIO****MANUFACTURERS OF THE DUNHAM RADIATOR TRAP, THE DUNHAM BLAST TRAP, THE DUNHAM AIR VALVE AND THE DUNHAM VACUUM AND VACUO VAPOR SYSTEMS OF HEATING.****The Dunham Radiator Trap****THE DUNHAM RADIATOR TRAP**

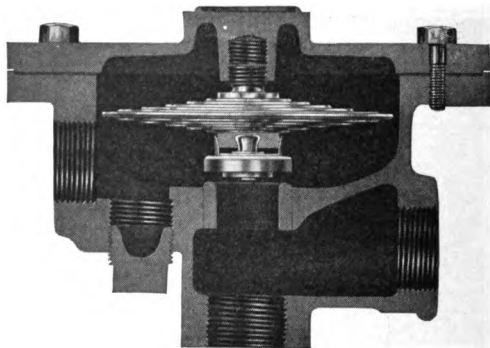
for use in connection with the Dunham Vacuum and Dunham Vacuo Vapor Systems of Steam Heating. It will positively allow for the complete discharge of water and air from the radiator to which it is attached without loss of steam. Constructed of phosphor bronze.

Made in four patterns—Right hand, left hand, straightway and angle.  
Size connections— $\frac{1}{2}$  inch pipe. Capacity—350 sq. ft. direct radiation.  
Maximum steam pressure—10 lbs. Wt.  $2\frac{1}{2}$  lbs.

**THE DUNHAM BLAST TRAP**

for use in draining blast coils in vacuum or other steam heating systems. Also for use on large direct radiating units where the Dunham Radiator Trap is too small. Positively opens for water and air and closes for steam. Body made of cast iron.

Care must be taken in reducing blast surface to equivalent direct by multiplying by a factor ranging from 3 to 9, depending upon the temperature, velocity and volume of air being forced over the coils.

**The Dunham Blast Trap**

| Size            | Capacity                      | Connection           | Wt.     |
|-----------------|-------------------------------|----------------------|---------|
| $\frac{3}{4}$ " | 1500 sq. ft. direct radiation | $\frac{3}{4}$ " pipe | 13 lbs. |
| 1"              | 3000                          | 1" pipe              | 21 "    |

**THE DUNHAM AIR VALVE**

This valve is made for use in revamping both old and new air-line jobs. It is built upon the same principle as the Dunham Radiator Trap. Is made of cast bronze, nickel plated all over and has union nut and nipple. Made for  $\frac{1}{8}$  inch pipe connection. Architects and engineers can specify this valve with the positive assurance that it will give service without necessitating the attention that is required to keep so many other air line valves in working order.

**DUNHAM VACUO VAPOR SYSTEM**

is simply a low-pressure system of heating that works upon pressure, vapor, and vacuum, without necessitating the use of a vacuum pump. It is particularly applicable to residence, apartment house, and church heating where low pressure (below 2 lbs.) boilers are used.

*Complete information, catalog and prices will be sent on application*

The Dunham System is installed in such buildings as the Woolworth Bldg., N. Y.; 80 Maiden Lane Bldg., N. Y.; Insurance Exchange Bldg., Chicago; Sherman Hotel, Chicago, and hundreds of other buildings all over the country.

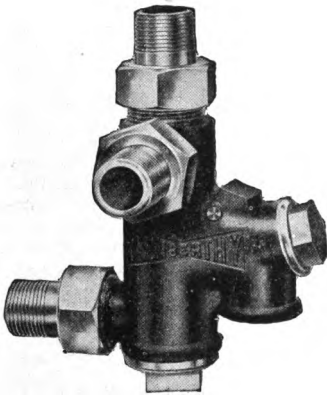
## PENBERTHY INJECTOR CO.

DETROIT, MICH.

### BRANCHES

NEW YORK CITY; WINDSOR, CAN.; LONDON, ENG.; HANOVER, GERMANY; PARIS, FRANCE

**MANUFACTURERS OF INJECTORS, EJECTORS, VALVES, STEAM SPECIALTIES AND LUBRICATING DEVICES.**



Penberthy Automatic Injector



### AUTOMATIC INJECTORS

*Work Low, 20 to 22 lbs.*

*Work High, 165 to 170 lbs.*

*Lift Water, 20 to 24 feet*

*Handle Hot Water, up to 130°*

*Automatic Qualities.*—The Penberthy is a perfect restarting automatic machine. By this we mean, when the Injector is working and forcing water to the boiler, if the current of water be suddenly broken by any cause such as a sudden jar or jolt, the Injector will pick up the water and again establish the current to the boiler automatically, without the manipulation of a single valve or the least attention from an attendant.

Recognized standard of the world.

Sales 800,000 since 1886

### XL-96 EJECTOR

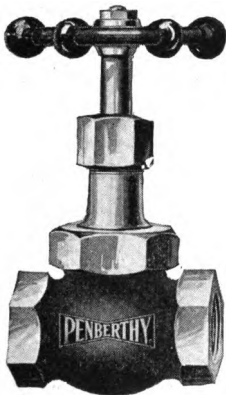
*Lifts 22 to 25 feet*

*Elevates 25 to 100 feet*

The *lifting* and *elevating* power is so combined in the XL-96 ejector as to make it unquestionably the best device of its kind. All other ejectors which will lift 20 feet will elevate but 20 to 25 feet additional, and this only on very limited steam pressures.



Penberthy XL-96 Ejector



Penberthy Regrinding Valve

### REGRINDING VALVES

The ever increasing demand today by Power Plant owners and steam users in general is for valves that will give absolutely reliable service and dependability under high pressures and severe conditions, and that are free from unnecessary renewal of discs and repair parts. To meet this demand the Penberthy Regrinding Valve has been designed. It is the result of many years practical experience in the manufacture of high grade brass goods, and embodies the best mechanical ideas employed in mechanical construction. It is amply heavy, and the distribution of metal is such that parts subjected to the greatest strain and wear have proportionately heavier walls. For the present we illustrate only the medium pattern type, which are designed for a constant working pressure of 200 pounds.

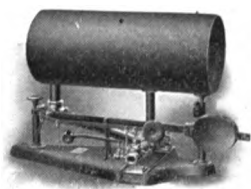
Complete Catalog No. 26 on request. Reply to Dept. CC.

## MOREHEAD MFG. CO.

DETROIT, MICH.

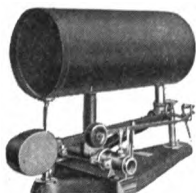
**TILTING STEAM TRAPS, RETURN, NON-RETURN, VACUUM AND CONDENSER TYPES, FOR DRAINING HIGH OR LOW PRESSURE AND VACUUM HEATING SYSTEMS OF WATER OF CONDENSATION, and where desired, returning the condensation to the boiler as feed water.**

### RETURN STEAM TRAP



Morehead Return Steam Trap

The Return Steam Trap removes water of condensation from heating, drying and cooking apparatus and returns the condensation direct to the boilers regardless of any difference in pressure on the apparatus drained and the boiler or whether the apparatus is located above or below the water line. It is admirably adapted for use as a lift pump and for feeding boilers from open or closed heaters. It handles perfectly, water at any temperature.

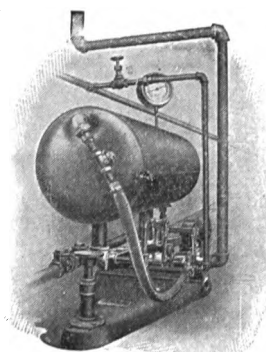


Morehead Non-Return Steam Trap

### NON-RETURN TRAP

This type of Morehead Steam Trap is especially adapted to the removal of condensation from high or low pressure steam mains, dryers, heaters, etc., and delivering the water to an open tank, hot well or feed water heater. This trap has a removable seat and disc in the valve. It discharges from low point, insuring an effective *water seal* at all times. It is guaranteed for 200 lbs. working pressure.

### VACUUM TRAP



Morehead Condenser Trap

The Vacuum Trap removes automatically all condensation from exhaust lines and oil separators operating under a vacuum without breaking or impairing that vacuum. It delivers the water of condensation to any desired point above or below the location of the trap and is guaranteed not to affect the vacuum in any way.

### CONDENSER TRAP

The Condenser Trap is a combination of the features of a Morehead Automatic Return Trap and the Jet or Spray Condenser. It is especially adapted to service on exhaust steam and reduced pressure heating, cooking and drying apparatus. The *positive vacuum* formed in the tank of the trap removes rapidly all condensation in the system, accelerates the travel of the steam and reduces the back pressure on the engine.

This is a cut of an actual installation. The check valves and gage shown in cut are only furnished as extras.

There is a Morehead Steam Trap to meet every condition arising in a steam or gas plant.

# MOREHEAD MFG. CO.

## MOREHEAD TILTING NON-RETURN STEAM TRAPS

### Sizes and Capacities

| No. | Inlet Inches | Outlet Inches | Capacity in Water Discharged per Hour | Drainage Capacity in 1 inch Pipe Lineal | Capacity Square Feet Direct Radiation | Capacity Lineal Feet Hot Blast Heater | Weight |
|-----|--------------|---------------|---------------------------------------|---|---------------------------------------|---------------------------------------|--------|
| 21  | 1            | 1             | 200 gal.                              | 12000 ft.                               | 3000                                  | 1300                                  | 100    |
| 22  | 1¼           | 1¼            | 400 "                                 | 25000 "                                 | 5200                                  | 2400                                  | 175    |
| 23  | 1½           | 1½            | 600 "                                 | 40000 "                                 | 12000                                 | 5200                                  | 250    |
| 24  | 2            | 2             | 720 "                                 | 60000 "                                 | 21000                                 | 9000                                  | 275    |
| 25  | 2½           | 2½            | 900 "                                 | 90000 "                                 | 33000                                 | 16000                                 | 350    |
| 26  | 3            | 3             | 1300 "                                | 140000 "                                | 50000                                 | 25000                                 | 450    |

## MOREHEAD TILTING RETURN, VACUUM AND CONDENSER STEAM TRAPS

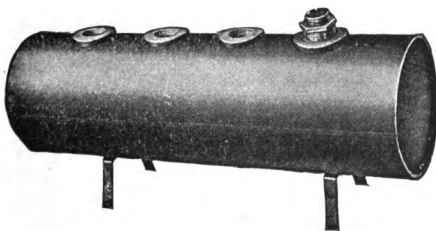
### Sizes and Capacities

| No. | Size of Drum | Size of Inlet and Outlet Connections Inches | Size of Steam Pipe Connections Inches | Capacity of Water in Lbs. per Hour | Drainage Capacity in feet of 1 inch Pipe Lineal | Capacity Square Feet Direct Radiation | Capacity Lineal Feet Hot Blast Heater | Weight |
|-----|--------------|---|---------------------------------------|------------------------------------|---|---------------------------------------|---------------------------------------|--------|
| 1   | 10x24        | 1   | 1                                     | 1050                               | 5000  | 2300                                  | 1000                                  | 100    |
| 2   | 12x30        | 1¼  | 1                                     | 1850                               | 9000  | 4000                                  | 1800                                  | 175    |
| 3   | 14x36        | 1½  | 1¼                                    | 4000                               | 20000   | 9000                                  | 4000                                  | 250    |
| 4   | 16x40        | 2   | 1¼                                    | 6000                               | 35000   | 16000                                 | 7000                                  | 275    |
| 5   | 18x42        | 2½  | 2                                     | 11000                              | 50000   | 25000                                 | 12000                                 | 350    |
| 6   | 18x42        | 3   | 2                                     | 15000                              | 75000   | 40000                                 | 18000                                 | 400    |

The above capacities are figured on a basis of 50 pounds pressure to the square inch. The above drainage capacity in inch pipe is based on ordinary radiating conditions. For lumber kilns, greenhouses and moist goods, divide by two. For laundries, brick dryers and wet goods, divide by three. For fan stacks and blowers, divide by five.

NOTE—3 feet of 1 inch pipe equals one square foot of surface. 2.3 feet of 1¼ inch pipe equals one square foot of surface. 2 feet of 1½ inch pipe equals one square foot of surface. 1.61 feet of 2 inch pipe equals one square foot of surface.

## MOREHEAD RECEIVERS



| No. | Length Inches | Height Inches | Diameter Inches |
|-----|---------------|---------------|-----------------|
| 1   | 30            | 16            | 10              |
| 2   | 40            | 20            | 12              |

No. 1 Receiver has capacity for Traps Nos. 1 and 2. No. 2 Receiver has capacity for Traps Nos. 3, 4, 5 and 6.

We will be glad to advise regarding the installation of traps to meet the conditions of your steam system.

## ROBERT A. KEASBEY CO.

100 N. MOORE ST., NEW YORK CITY

**PIPE AND BOILER COVERINGS**—85% Magnesia; Asbestos, Air-Cell or Moulded; Cork, Wool Felt.

**INSULATING MATERIALS** for Heat and Cold, Asbestos Cements, Paper and Millboard, Hair Felt, Mineral Wool, etc.

**PACKINGS OF ALL KINDS**—Asbestos, Flax, Cotton, Rubber, Metallic.  
**BRAKE BAND LININGS. COLD WATER PAINT.**

### MAGNESIA SECTIONAL COVERING

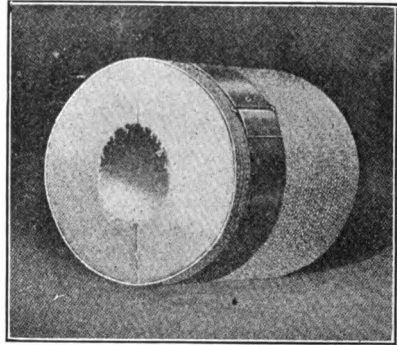
(Containing 85 per cent. Carbonate of Magnesium)

#### KING OF COVERINGS

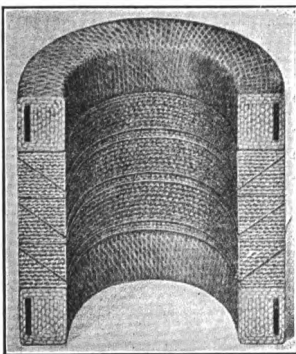
Made in sections three feet long, halved to fit pipe from  $\frac{1}{2}$ " to 10" inclusive, canvas jacketed. Standard thick (approximating 1"),  $1\frac{1}{2}$ " thick, 2" thick (double standard thick) and double  $1\frac{1}{2}$ " thick to be used when different results of efficiency are desired.

Also in Cement form (85% Magnesia Plaster) for fittings, irregular shapes, filling spaces, etc.

Also in Blocks (85% Magnesia Blocks) 3" x 18" and 6" x 36" from  $\frac{1}{2}$ " to 4" thick. Catalog of these and all styles furnished upon request.



### "RAKCO" BRAND, ASBESTOS, FLAX, COTTON, AND RUBBER PACKINGS



These packings are manufactured with great care from the highest class of materials to suit all kinds of service.

Special conditions frequently make it advisable to use various combinations of packings. In this event we recommend our Combination sets of Packings, as we have special sets to meet every known condition. These different sets are made to exactly fill the stuffing box, and when ordering same it is necessary that we have diameter of the rod and diameter and depth of box stuffing.

Catalog on request.

### CONTRACTS EXECUTED

Contracts for covering pipe; propositions involving insulation materials, or other work in our line will be handled with the advantages secured by a large stock, and a competent force of men. Correspondence solicited.



# ARMSTRONG CORK & INSULATION CO.

122 TWENTY-FOURTH ST., PITTSBURGH, PA.

Branch Offices in the Large Cities

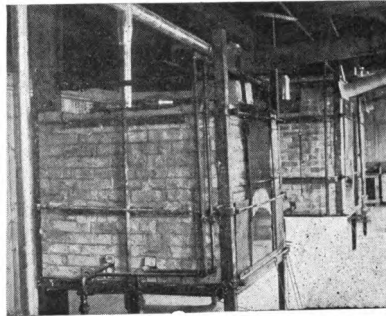
**NONPAREIL INSULATING BRICK** for Boiler Settings, Furnaces, Core, Japanning and Mold Drying Ovens, Waste Gas Mains, Bake-ovens, Kilns, etc.; **NONPAREIL HIGH PRESSURE COVERING** for Steam Lines and Boilers, etc.; **NONPAREIL CORK COVERING** for Brine, Ammonia and Ice Water Lines; **NONPAREIL CORKBOARD INSULATION** for Cold Storage Plants.

## NONPAREIL INSULATING BRICK

Nonpareil Insulating Brick are the most suitable form of insulation yet devised for reducing the heat loss by radiation from boiler settings, ovens, furnaces, kilns, etc. They have a high heat insulating efficiency, ten times that of fire brick or common brick; are very light in weight, yet sufficiently strong to be built in as an integral part of the structure to be insulated, and are easy to install, being readily cut and shaped.

Nonpareil Brick are made of diatomaceous earth (kieselguhr), a small quantity of clay and finely ground cork. In the process of manufacture the cork is burned out, giving the materials a peculiar porous texture. The brick measure  $9 \times 4\frac{1}{2} \times 2\frac{1}{2}$  inches.

While Nonpareil Brick are not in any sense a refractory material, they will withstand relatively high temperatures. The fusing point is above  $1800^{\circ}\text{F.}$ , which is higher than any temperature they will encounter if correctly installed. They can be utilized to advantage to back up fire brick in any place where the retention of heat is desirable. Full sized sample brick and literature will be sent on request.



Annealing Ovens Insulated with Nonpareil Insulating Brick, Jefferson Glass Co., Follansbee, W. Va.

## NONPAREIL HIGH PRESSURE COVERING

Nonpareil High Pressure Covering is composed of diatomaceous earth and asbestos fibre. Compared with other high pressure coverings, it is not only a better nonconductor of heat, but will withstand much higher temperatures without calcining or disintegrating. It is particularly well-suited, therefore, for the insulation of superheated steam pipes, retorts, etc. Moreover, it will bear repeated wetting and drying without injury, and for this reason is an ideal form of covering for underground steam lines. It is easy to apply—being furnished in sectional, block and plastic cement form—and so far as price is concerned, will compare favorably with any high-grade covering on the market.

## NONPAREIL CORK COVERING

Nonpareil Cork Covering for brine, ammonia and drinking water systems in office buildings, mills, factories, etc., is composed of pure, granulated cork compressed and molded in sectional form to fit the different sizes of pipe and various fittings in ordinary use. Nonpareil Cork Covering is not only more efficient than other coverings when first applied, but remains so because it does not absorb moisture and will, therefore, not mold or rot. It is, moreover, light, clean, neat in appearance and easy to apply. Catalogue and sample on request.

## NONPAREIL CORKBOARD

Nonpareil Corkboard is the world's standard cold storage insulation. It is composed of pure granulated cork, made into boards  $12 \times 36$ -inches, of various thicknesses from one to six inches. Descriptive literature and samples on request.

## AMERICAN BALANCE VALVE CO.

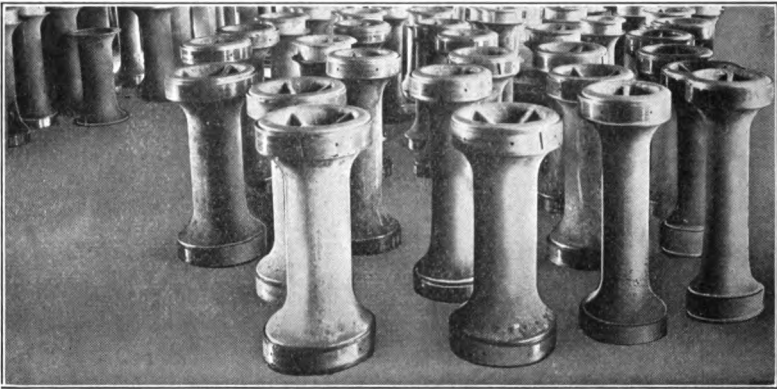
Established 1890

JERSEY SHORE, PENNA.

BALANCED MAIN VALVES FOR EVERY SERVICE

### AMERICAN SEMI-PLUG PISTON VALVE

For Superheated Steam of Any Degree or Saturated Steam of Any Pressure up to 1000 Pounds

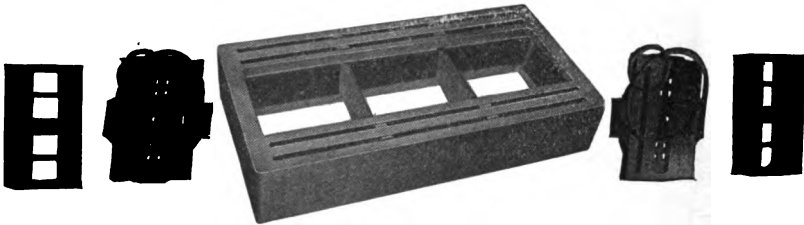


These Valves are Frictionless, are Steam-tight and *REMAIN SO*. They are Maintained by DUPLICATE parts from *STOCK*. When under Pressure this Valve is a PLUG and when without Pressure it is a Snap Ring Valve.

Can be fitted to any Piston Valve Engine.

### JACK WILSON HIGH PRESSURE SLIDE VALVE

Double-Ported. For Pressures up to 240 Lbs. and Superheat to 600° F.



BALANCED in all positions of travel. Double Admission, Double Exhaust and made for Internal or External Admission.

Can be fitted to any Slide Valve Engine.

When Designing or Repairing Engines, you should investigate these Modern Balanced Valves. *Descriptive matter cheerfully furnished.*

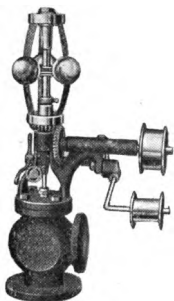
# THE PICKERING GOVERNOR CO.

PORTLAND, CONNECTICUT

GOVERNORS FOR STEAM ENGINES, GAS ENGINES, STEAM TURBINES,  
MECHANICAL CONTROL AND POWER REGULATION.

Owing to the absence of joints our Governors are very responsive to slight changes in load, moving quickly and positively into correct position for maintaining the admission of steam proportionate to the duty required of the engine. Absence of joints gives maintenance in efficiency under continued and severe duty.

Speed Rangers are incorporated, permitting wide range in adjustment of Engine speed while running.



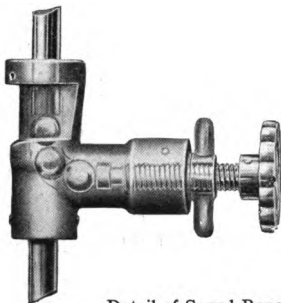
Class A



Class B Vertical



Gov. with Stop Valve



Detail of Speed Ranger

Class A Governors are equipped with safety stop which shuts off steam from the engine if governor drive belt should break. Class B are not equipped with safety stop. Horizontal B is never provided with safety stop. Governor with stop valve does away with joint between governor and valve.



Class B Horizontal

TABLE OF DIMENSIONS, ETC., FOR CLASSES A AND B

| Size of Governor<br>Diameter of Opening | 1½  | 1¾  | 2   | 2½  | 2¾  | 3   | 3½  | 4   | 4½  | 5   | 6   | 7   | 8   | 9   | 10  |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| From center of inlet to base.....       | 3½  | 3¾  | 4½  | 4¾  | 5½  | 5¾  | 6½  | 7½  | 7¾  | 8   | 8½  | 9   | 10  | 11½ | 11¾ |
| Extreme Height.....                     | 20½ | 23½ | 25½ | 27½ | 27½ | 32½ | 33½ | 41½ | 41½ | 46½ | 49½ | 49½ | 53½ | 55½ | 60½ |
| Extreme expansion of Balls.....         | 7   | 8   | 8   | 9   | 9   | 10  | 10  | 13  | 13  | 15  | 16½ | 16½ | 18  | 20  | 20  |
| Speed of Governor.....                  | 350 | 380 | 380 | 300 | 300 | 340 | 340 | 320 | 320 | 275 | 275 | 275 | 260 | 260 | 225 |
| Dia. of Pulley on Governor.....         | 2½  | 3½  | 3½  | 4   | 4   | 4   | 4   | 5   | 5   | 5   | 6   | 7   | 7   | 8   | 8   |
| Dia. of Cyl. 300 ft. Piston Speed.....  | 6   | 7   | 9   | 10  | 12  | 14  | 16  | 18  | 20  | 22  | 26  | 31  | 36  | 40  | 45  |
| " " " 400 " " ".....                    | 5   | 6   | 8   | 9   | 10  | 12  | 14  | 16  | 18  | 20  | 23  | 27  | 31  | 35  | 39  |
| " " " 500 " " ".....                    | 4½  | 5   | 7   | 8   | 9   | 10  | 12  | 14  | 16  | 18  | 21  | 24  | 28  | 31  | 35  |
| " " " 600 " " ".....                    | 4   | 4½  | 6   | 7   | 8   | 9   | 11  | 13  | 15  | 16  | 19  | 22  | 25  | 28  | 32  |

For complete table and for sizes below 1¼—see our general catalogue.

## TRILL INDICATOR CO.

CENTER ST., CORRY, PA.

MANUFACTURERS OF ENGINEERS' INSTRUMENTS

### TRIUMPH OUTSIDE SPRING INDICATOR

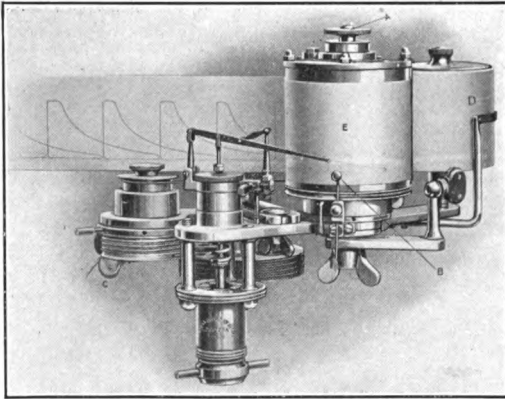
To meet the conditions of high pressure and high temperature which obtain in modern steam engineering, also to meet the high temperature requirements for indicating gas engines, we have perfected a Triumph Indicator having the compression spring entirely outside of the cylinder. This construction tends to keep the spring cool, eliminates the possibility of corrosion, and prevents deterioration of the spring from the hot exhaust of gas engines.

#### Points of Superiority

1. Atmospheric line can be adjusted by merely turning a small nut on the pencil motion.
2. Absolutely parallel pencil motion.
3. No wrenches necessary to change the springs.
4. Attached reducing motion giving absolutely accurate reductions, and adaptable for 6 in. to 60 in. strokes.
5. Adjustable recoil springs so that the indicator can be used on high or low speed engines.
6. Automatic cord take-up device. You do not have to unhook the cord after taking each card.
7. A high and low pressure cylinder. For high pressure work you insert another cylinder of half the area inside of the main one.
8. No cord trouble. Tie knots first and place cord directly in position.



### TRILL CONTINUOUS CARD INDICATOR



While the ordinary indicator meets the usual requirements, there are circumstances in which it is desirable to have a card for every stroke of the engine. To meet this condition the Trill Continuous Card Indicator has been perfected.

The indicator is attached to the engine, the same as the ordinary indicator. Instead of having to insert a card for every diagram, the instrument is provided with two drums, one of which contains a roll of paper of 250 feet, the other drum being used for tracing the diagram.

When the indicator is started, the paper from the roll automatically feeds onto the tracing cylinder, and a card will be secured for every stroke of the engine. Or in case it is not desired to indicate every stroke, the feed of the paper can be stopped at any time and one complete card taken.

The continuous indicator shows what is going on in an engine over any length of time. This is of special value when indicating gas engines, where the mixture is liable to change, or several strokes may be missed, or back firing occur. The trouble and bother of inserting a card for every diagram desired is also eliminated.

# ALBANY LUBRICATING CO.

ADAM COOK'S SONS, PROPS.

708-10 WASHINGTON ST., NEW YORK

MANUFACTURERS OF LUBRICATING OILS AND GREASES



Reg. U. S.

Pat. Office

Albany Grease is a pure lubricant so compounded that it automatically maintains a film of oil between rubbing surfaces, reducing friction losses to a minimum. It contains no adulterants and is guaranteed not to oxidize, gum or corrode the metal of the bearings. Made in different consistencies to meet different temperature conditions.

You must consider two things when lubricating machinery of any kind. First—Is the lubricant efficient? Does it give perfect satisfaction at all times or only part of the time? Second—Is the lubricant economical? Does it do its work at the lowest possible cost or is it wasteful?

Albany Grease is efficient and economical at all times. It is efficient because it will lubricate any kind of machinery and line shafting perfectly.

It can be used in any kind or style of grease cup and will not gum, cake or clog. It will not corrode, neither will it turn a reddish color, showing that it contains no acids. Albany Grease will remain a golden yellow to the end.

It is economical because it stays where you put it and does not run or leak away. When the machine is not in operation, Albany Grease does not flow. It will flow just enough to give perfect lubrication—no more. These are facts that you should bear in mind when buying a lubricant.

Albany Grease will show wonderful results on Line Shafting and Loose Pulleys, also on Steam, Gas, Gasoline or Oil Engine Main Shaft bearings, Crank Pins, Eccentric and Slides. On special machinery, such as Printing Presses, Shoe machinery, Coal and Metal Mine equipment, Sugar machinery, Cotton, Woolen and Paper Mill installations, Lumber Camp machinery, Wood Turning, Sawing machines and Steel Mills, it gives the best of service. In fact no matter what kind of machinery you have, Albany Grease will lubricate it so that it will operate perfectly, keeping it cool and easy running, and reducing depreciation to a minimum.

Albany Grease is made in several different consistencies to meet various conditions and temperatures. Use the right consistency for your work and you will have absolutely no trouble.

**SOFT NUMBERS** (No. 0 and 1) for slow running, heavy machinery or where equipment is operated outdoors or low temperature has to be contended with.

**MEDIUM NUMBERS** (No. 2 and 3) for general machinery and shafting, the former is known as a winter grease and the latter as a summer grease. These are the most general and called for numbers.

**HARD NUMBERS** (No. X, XX, XXX) for use in places where the Soft and Medium numbers are not adapted, especially where the temperature surrounding the bearings is high the No. XXX has the highest melting point with great lubricating value.

Due to the wide publicity given Albany Grease, unscrupulous concerns occasionally substitute inferior goods for our product. When purchasing Albany Grease, insist that our trade mark appear on the package.

We also refine and manufacture in addition to Albany Grease, lubricating oils and greases to meet all requirements. No matter what your lubricating proposition may be, we can supply your entire wants. We will be glad to send complete data covering the entire lubrication of your equipment and place at your disposal expert engineering service.

## THE TEXAS COMPANY

NEW YORK AND HOUSTON

**MANUFACTURERS OF LUBRICATING OILS, ENGINE AND MACHINE OILS AND GREASES. LUBRICATING OILS PREPARED ESPECIALLY FOR USE OF TURBINES, GRAVITY-FEED AND FORCE-FEED SYSTEMS UNDER ALL CONDITIONS.**

---

The Texas Company is soliciting business on an economy basis. This does not mean that we have increased our number of consumers by furnishing them cheaper oils. This consideration as a rule does not mean efficiency. We have drawn customers to us by supplying them better oils. Better because they are more suited to the purpose. More economical because they are prepared with the conditions and methods of application of the consumer kept constantly in mind.

More efficient because of the increased facilities for knowing the consumers' requirements, and of meeting these requirements through an organization with most modern methods of preparation and selecting the best crudes for each particular use.

In the larger plants lubrication is a problem carrying extra gravity, due to the severe conditions of work and it is here that the value of TEXACO LUBRICANTS is most forcibly demonstrated.

TEXACO LUBRICANTS are peculiarly fitted to meet severe conditions. They lubricate perfectly, separate readily from any water that may get into the oil through leakage and they stand up well under severe work, maintaining as high lubricating properties after a thousand hours as shown, when the oil was new.

Another very essential feature contributing to the general excellence of TEXACO LUBRICANTS is their low cold test. This is especially important in large stations where the oil is pumped from a central filtering plant to the engine. It will eliminate the shutting down of the station in cold weather on account of the oil having congealed.

The TEXACO OILS for general, rolling-mill and manufacturing plant lubrication are of such a nature that great economy will result in their use. Every requirement of lubrication, whether power economy, general plant economy, or cost can be met by TEXACO LUBRICANTS.

We publish a quarterly—"Lubrication." It ought to contain something of interest to you. It's yours for the asking. Address, THE TEXAS COMPANY, Department M. E., 17 Battery Pl., N. Y. City.

## GREENE, TWEED & CO.

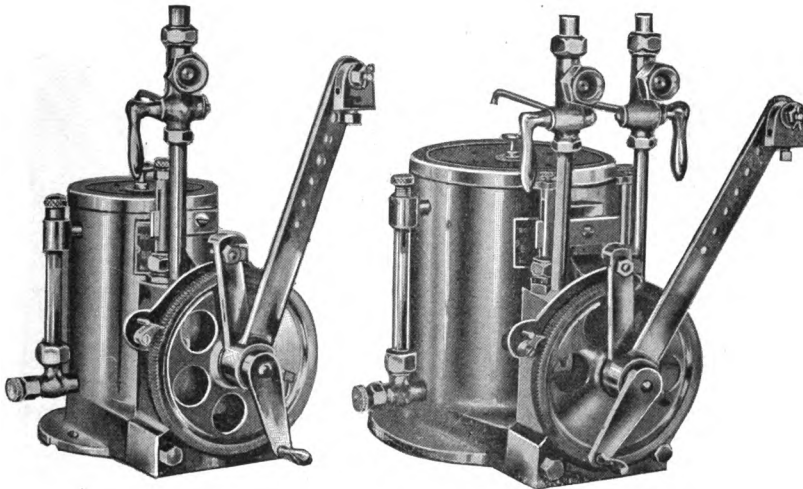
109 DUANE ST., NEW YORK.

**MANUFACTURERS OF THE ROCHESTER AUTOMATIC LUBRICATORS, PALMETTO AND MANHATTAN PACKINGS, WRENCHES, BELT FASTENERS AND OTHER MILL SUPPLY SPECIALTIES.**

### THE ROCHESTER AUTOMATIC LUBRICATOR

In the manufacture of the Rochester Automatic Lubricator no expense has been spared, efficiency and high quality being our aim rather than low prices.

For the lubrication of the cylinders of all types of steam engines and pumps as well as air and ammonia compressors.



Single Feed—2 Pint Capacity

Double Feed— $\frac{1}{2}$  Gallon Capacity

Made in all sizes from one-half pint to two gallon and with any number of feeds from one to eight. Also made with two compartments, for use where different kinds of oil are used in the different cylinders of the same machine, such as air compressors, ice machines, etc.

Finish—all sizes fully nickel-plated.

Working parts are made of steel, and all bearings are case hardened.

All the mechanism can be instantly detached and removed, giving easy access to the working parts for cleaning, repairing, etc., without disturbing the bowl or reservoir attached to the engine.

Equipped with Multiplus Sight Feeds, and vacuum and check valves.

Each feed is regulated independently.

Not affected by temperature, pressure or vacuum.



Vacuum and Check Valve

## MADISON-KIPP LUBRICATOR CO.

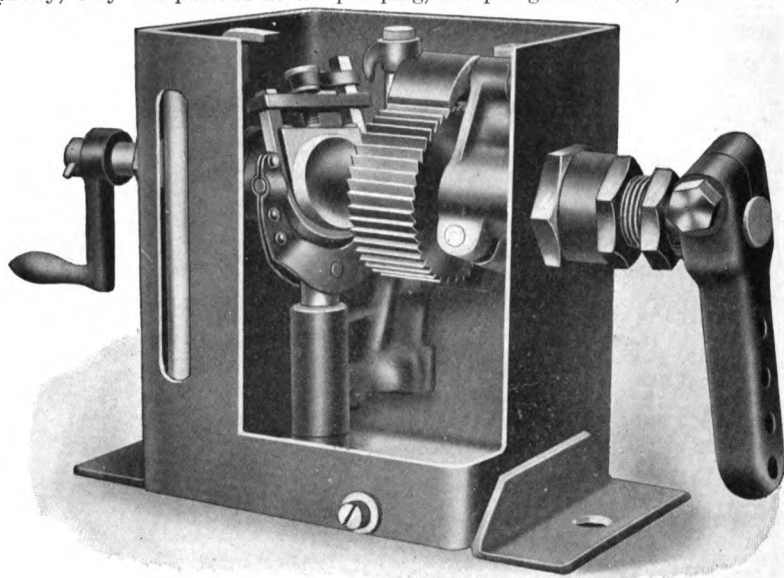
MADISON, WIS.

**MANUFACTURERS OF VALVELESS FORCE AND SIGHT FEED MECHANICAL LUBRICATORS for Steam, Gas and Gasoline Engine Lubrication.**

### MODEL 50 HEAVY DUTY LUBRICATOR

Built in any number of feeds from one to fifty

This Lubricator is built on the well known Kipp no valve principle, using no valve checks or other similar devices. The absence of valves of any kind in the pump passages permits a free and easy flow of the oil both on the suction and discharge side, thus permitting the accurate handling of very thick and very thin oils. The sectional view shows that the lubricator is the acme of simplicity, only two parts to do the pumping, the plunger and barrel, *No Valves*.



No check valves, no packing, hardened steel plungers accurately ground and working in chilled barrels. The hole in the barrel is ground smooth and true on internal grinding machines.

The shaft in the pump acts as an axle only. The drive is direct, hand pumping crank on all lubricators, protected gauge glass, sheet steel tank. All parts of liberal proportion, wear reduced to a minimum.

Individual regulation for each plunger.

|                        |       |        |       |        |        |        |        |       |        |       |        |        |
|------------------------|-------|--------|-------|--------|--------|--------|--------|-------|--------|-------|--------|--------|
| No. of Feeds . . . . . | 1     | 2      | 3     | 4      | 5      | 6      | 7      | 8     | 9      | 10    | 11     | 12     |
| Oil Capacity . . . . . | 2 qt. | 2½ qt. | 3 qt. | 3¾ qt. | 4½ qt. | 5½ qt. | 6¼ qt. | 7 qt. | 7½ qt. | 8 qt. | 8½ qt. | 9¼ qt. |

Madison-Kipp Lubricators are in daily use on mine pumps, boiler feed pumps, fire pumps, coal dock engines, hoisting engines, steam shovels and dredges, steam hammers, stationary engines both steam and gas, and steam and gas tractors.

We marketed our first force feed lubricator in 1898 and are the largest exclusive builders of force feed lubricators in the world. Over 500,000 giving perfect satisfaction in the most trying and exacting service is proof positive that the Kipp no valve principle is the correct method of pumping oil in small quantities accurately against high pressures and in all temperatures.



# McCORD MANUFACTURING CO.

DETROIT-MICHIGAN

NEW YORK

CHICAGO

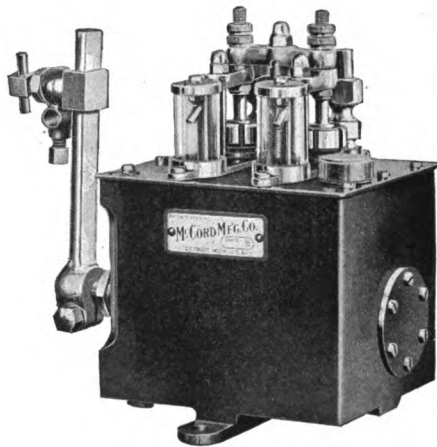
MANUFACTURERS OF FORCE FEED LUBRICATORS

## THE "McCORD" FORCE FEED LUBRICATOR

Is made in from 1 to 14 feeds and has a separate pump for each feed. Each pump has individual adjustment. It has constant sight feeds which show exactly how much oil is being pumped to each bearing and the flow can be adjusted from one drop to a full stream per stroke.

It is positive and automatic in action and operates in perfect synchronism with the engine or pump it is lubricating. It is not affected by viscosity of oil, variations in steam pressure or length of feed lines.

Note these standard features *and*  
*Positive sight feeds without pressure*  
*Separate pumps capable of individual adjustment for each feed*  
*Forced delivery of oil against pressure up to 1000 pounds, etc., etc.*



Class B—Two Feed

These special features.  
*Heating Chamber*  
*Auxiliary Hand Crank for accelerating feed*  
*Drop forged operating lever*  
*Reversible End Bearing*  
*Plug for draining reservoir*

There is positively no pressure in sight feed; all working parts are of the best drop forged steel and operate in oil. Rotary or Ratchet drive. Finish—full Nickle Plate or Black Enamel and Brass. Straightaway Spring Check Valves. Heating Chamber and Auxiliary Hand Crank furnished as extras when specified.

### ALL PRICES F. O. B. DETROIT

| No. | Capacity | Feeds  | List    | No. | Capacity      | Feeds   | List    |
|-----|----------|--------|---------|-----|---------------|---------|---------|
| 1   | 1 Quart  | 1 Feed | \$25.00 | 11  | 1 Gallon      | 5 Feed  | \$57.00 |
| 2   | 1 Quart  | 2 Feed | 30.00   | 12  | 1 Gallon      | 6 Feed  | 63.00   |
| 3   | 2 Quart  | 1 Feed | 28.00   | 13  | 1 1/2 Gallons | 7 Feed  | 75.00   |
| 4   | 2 Quart  | 2 Feed | 35.00   | 14  | 1 1/2 Gallons | 8 Feed  | 82.00   |
| 5   | 2 Quart  | 3 Feed | 42.00   | 15  | 1 1/2 Gallons | 9 Feed  | 90.00   |
| 6   | 2 Quart  | 4 Feed | 49.00   | 16  | 1 1/2 Gallons | 10 Feed | 96.00   |
| 7   | 1 Gallon | 1 Feed | 33.00   | 17  | 2 Gallons     | 11 Feed | 108.00  |
| 8   | 1 Gallon | 2 Feed | 39.00   | 18  | 2 Gallons     | 12 Feed | 115.00  |
| 9   | 1 Gallon | 3 Feed | 45.00   | 19  | 2 Gallons     | 13 Feed | 125.00  |
| 10  | 1 Gallon | 4 Feed | 51.00   | 20  | 2 Gallons     | 14 Feed | 135.00  |

### DOUBLE COMPARTMENT LUBRICATORS FOR AIR COMPRESSORS AND ICE MACHINES

|    |          |        |                    |         |
|----|----------|--------|--------------------|---------|
| 21 | 2 Quart  | 2 Feed | 1 Feed in each     | \$44.00 |
| 22 | 2 Quart  | 3 Feed | 2 & 1 Feed in each | 50.00   |
| 23 | 2 Quart  | 4 Feed | 2 Feed in each     | 57.00   |
| 24 | 1 Gallon | 2 Feed | 1 Feed in each     | 47.00   |
| 25 | 1 Gallon | 3 Feed | 2 & 1 Feed in each | 54.00   |
| 26 | 1 Gallon | 4 Feed | 2 Feed in each     | 60.00   |

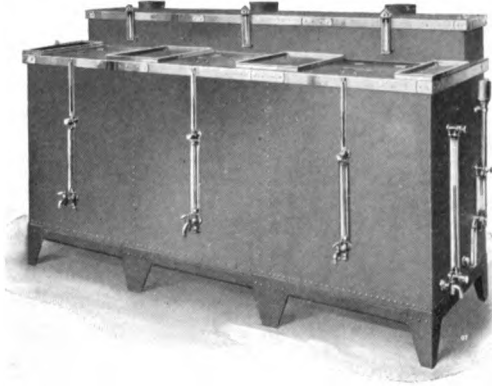
For Heating Chamber add \$1.00 to list. For Auxiliary Crank add \$1.00 to list.  
 See Catalog "T" for Details

## THE RICHARDSON-PHENIX CO.

126 RESERVOIR AVE., MILWAUKEE, WIS.

LUBRICATION ENGINEERS AND MANUFACTURERS

OILING AND FILTERING SYSTEMS FOR POWER PLANTS



**Peterson Power Plant Oil Filter**  
Built in Capacities of 100 to 1000 Gallons per Hour  
Described in Catalog S59

We advise and quote on the necessary material and apparatus or design and install complete Automatic Cylinder and Bearing Lubrication Systems, in which the oil is regularly and positively supplied in just the proper quantities and, in the case of bearing lubrication, is filtered and used over and over again.

Our experience in this work, extending over a period of many years, has placed us in possession of valuable data on this subject and there is hardly a question pertaining to machinery lubrication that we have not met and solved.

We would be pleased to correspond with those interested in automatic lubrication, with a view of explaining our proposition in greater detail.

### WE MANUFACTURE

The Richardson Sight Feed Oil Pump,  
The Phenix Mechanical Lubricator,  
The Richardson Oil Filter,  
The Phenix Oil Filter,  
The Peterson Power Plant Oil Filter,  
Individual Oiling and Filtering Systems,  
Central Oiling and Filtering Systems,  
Sight Feed Oilers,

Gang Oilers,  
Union-Cinch Pipe Fittings,  
Telescopic Oilers,  
Oil Pumps,  
Oil Sinks & Fountains,  
Sight Flow Indicators,  
Automatic Pump Governors,  
Tank Level Indicators, etc.

Systems for Storing, Measuring and Pumping Gasoline, Lubricating and Paint Oils, Varnishes, Drugs and Kindred Liquids.

*Ask for Literature Describing Any of the Above.*

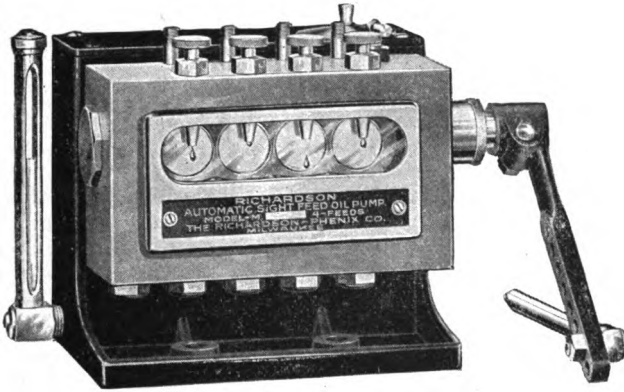
Our plant is the largest one devoted exclusively to the manufacture of lubrication Appliances. We manufacture "EVERYTHING FOR LUBRICATION BUT THE LUBRICANTS."

## THE RICHARDSON-PHENIX CO.

126 RESERVOIR AVE., MILWAUKEE, WIS.

LUBRICATION ENGINEERS AND MANUFACTURERS

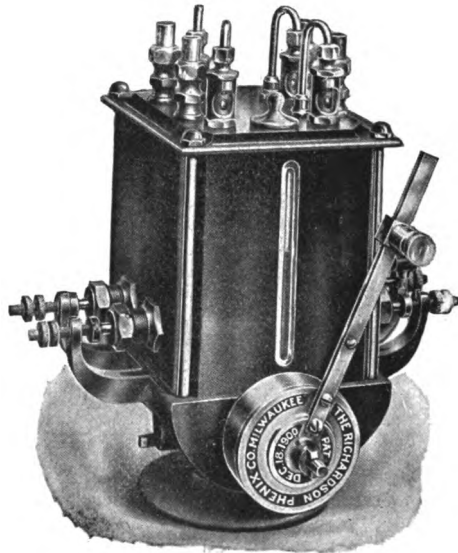
### THE RICHARDSON SIGHT FEED LUBRICATOR



operates on a new principle in that it supplies oil for cylinder lubrication in small particles for every stroke of the engine piston. Built in sizes of from one to twenty-two feeds and if desired can be furnished subdivided to handle two or more kinds of oil. Fully illustrated and described in catalog No. S-53.

### PHENIX LUBRICATOR OIL PUMPS

These lubricators are especially adapted to the lubrication of high-speed engines, all power plant auxiliaries, steam hammers, dredges, hoisting and traction engines, etc. Built in sizes from one to twelve feeds, square type and one to two feeds, round type. Can be furnished with divided tanks if desired. Salient Features: Delivers oil against any pressure up to several thousand pounds—at any lever stroke from  $\frac{1}{4}$  to 7 inches regardless of changes in temperature or viscosity of oil or length of feed line. Fully illustrated and described in catalog No. S-54.



## **PETERSON ENGINEERING CO.**

**MAIN OFFICE & FACTORY**

**630-40 HUBBARD ST.**

**MILWAUKEE, WIS.**

**NEW YORK OFFICE**  
Hudson Terminal Bldg.

**CHICAGO OFFICE**  
Otis Bldg.

**LUBRICATION ENGINEERS & CONTRACTORS**

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### **AUTOMATIC OILING & FILTERING SYSTEMS DESIGNED AND INSTALLED**

Appreciating the necessity of improving power plant lubrication and putting it on a sound, scientific basis, this Company, several years ago, started to devote its energies exclusively to the design and installation of automatic bearing and cylinder lubrication systems; in fact, we were the pioneers in this branch of engineering. One of the results of the remarkable economies that have been effected by our lubricating systems and of the wide publicity that we have given the subject of scientific power plant lubrication, is that, whereas a few years ago, automatic lubrication was given only passing attention, now there is hardly a well designed large power plant installed, in which filtering, recirculating and measuring lubricating oil is not provided for.

As a result of our specialization, we have designed and installed automatic oiling and filtering systems in small plants having only a single engine, as well as enormous systems in large public service plants, which circulate and filter over a million gallons of lubricating oil per day.

It is evident that the advice of lubrication experts is desirable when it is considered that the type of lubricating system to be used in a large plant depends a great deal on local conditions, such as type of prime mover, the size of the plant, kind and price of oil, amount of entrained water and foreign matter in the used oil, the attendance necessary, grouping of the units, the layout of the engine room, etc.

We are not engaged in any other line of business and every piece of apparatus or system has the personal supervision of competent engineers, familiar with modern lubrication practice. The design of every lubricating system which we undertake, is the result of personal investigation into the needs of modern power plants and represents a great deal of original experiment and development work.

We advise and quote on the necessary material and apparatus, or design and install on a contract basis, lubricating systems for all types of plants. Our engineering department will co-operate with power plant owners, consulting engineers, machinery builders and contractors in making designs and recommending the best type of system to meet local conditions.

# FIBRE FINISHING COMPANY

GENERAL OFFICES: 27 STATE ST., BOSTON, MASS.

Factory: Greendale, Worcester, Mass.

MANUFACTURERS OF VELLUMOID AND FIBRE SPECIALTIES

## VELLUMOID PACKING

Vellumoid is a gasket material consisting of a closely formed sheet of vegetable fibres treated by a patented process which renders it oil, grease, air and water proof and exceedingly tough like leather. It contains no rubber or rubber substitute, mineral matter or other materials commonly found in gasket material. It is light in weight, very flexible and has a relatively high tensile and tearing strength. Vellumoid is covered by both process and product patents.

### Where Vellumoid Packing May Be Used to Advantage

**AUTOMOBILES AND GAS ENGINES**—The oil, grease, gasoline and waterproof qualities of Vellumoid make it a most excellent material for gaskets for automobiles and gas engines. It is not adaptable for the exhaust because of the high temperature. It is, however, the best packing that can be used for carbureter connections, gear case covers, differential covers, water inlet and outlet, in fact in every place where the temperature is not excessive.

**LOW PRESSURE AND EXHAUST STEAM**—Vellumoid has been proven to be a most superior packing for all low pressure and exhaust steam work. For higher steam pressures Vellumoid is not recommended because of the high temperature.

**PUMPS OF ALL KINDS**—Vellumoid has been tested and proved to be the best material on the market for all kinds of pumps; oil, gasoline, water (hot or cold) ammonia, weak acids and alkalis have absolutely no deteriorating effect upon it.

*To summarize*, Vellumoid is a most excellent packing for all ordinary substances except concentrated acids and alkalis, under any pressure where the temperature is not excessive. It is more expensive than paper which is more or less commonly used for automobiles and gas engines, but the extra cost is offset by longer life and greater efficiency, its flexibility making a much tighter joint than is possible with paper.

## DATA

Vellumoid is stocked in rolls or sheets in the following approximate thicknesses and weights:

|                    | Thickness | Weight per<br>Sq. Yd (Approx.) |
|--------------------|-----------|--------------------------------|
| No. 1 Packing..... | .006"     | 5 oz.                          |
| No. 2 Packing..... | .010"     | 8 oz.                          |
| No. 3 Packing..... | .015"     | 14 oz.                         |
| No. 4 Packing..... | .021"     | 24 oz.                         |
| No. 5 Packing..... | .032"     | 32 oz.                         |

Vellumoid can be made up specially for manufacturers who desire other weights. Finished gaskets are also furnished for those who are not equipped for cutting their own gaskets.

# GOETZE GASKET AND PACKING CO.

22 ALLEN AVE.

NEW BRUNSWICK, N. J.

**METAL GASKETS OF VARIOUS TYPES. METALLIC ENGINE PACKING. SHEET PACKING FOR FLANGES. VALVE GASKETS OR DISCS.**

## GOETZE NO. 2 ELASTIC GASKET

A Copper-Asbestos Gasket—the copper is corrugated and the closely twisted asbestos is held in the corrugation as shown in the cut at the left.

While unlike the Goetze Devo Gasket in construction, it is also recommended for high pressures, high temperatures and the most exacting service generally.

When used for flanges, it makes a joint practically as leak proof as the pipe itself, even with the roughest, most uneven surfaces.

Guaranteed for five years and sent on 90 days' trial.



## DEVO GASKETS

These are made of corrugated steel covered with asbestos which in turn is covered with graphite.

They are intended for use in connection with high pressure, superheated and saturated steam and other unusually severe conditions and will hold tight against extremes of pressure and temperature.

Devo Gaskets appeal to every practical engineer because they are indestructible and low in price.

Every Devo Gasket is guaranteed for five years and will be replaced within that time if found unsatisfactory.



## GOETZE'S VALVE GASKETS OR DISCS

These are intended for valves of the Jenkins type and are made of copper and asbestos. The illustration shows a plan and section and it will be noticed that the hole has two flat sides as is common in most makes of valve discs. They are made in the following sizes;  $\frac{1}{4}$ ,  $\frac{3}{8}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1,  $1\frac{1}{4}$ ,  $1\frac{1}{2}$ , 2,  $2\frac{1}{2}$ , 3,  $3\frac{1}{2}$ , 4,  $4\frac{1}{2}$ , 5, 6, 7, 8, 9, 10 and 12 inches.



# THE FRANCE PACKING COMPANY

TACONY, PHILADELPHIA

FRANCE METAL PACKING FOR EVERY SERVICE

## FRANCE METAL PACKING

France Metal Packing for steam, air, gas or ammonia is made of Vanadium Cast Iron—the best wearing metal known.

For superheated steam on Vertical Engine, Bronze or Bell Metal is used, depending upon the pressure.

The cases are made of cast iron.

The packing is designed for your engine and your conditions. It will last from 5 to 20 years. It is rented or sold on approval.

France Packing is *not* a lead, babbitt, shredded, graphited or semi-metal packing that destroys your rods. It is made of a tough metal, machined to fit your engine. Nothing but metal touches the rod.

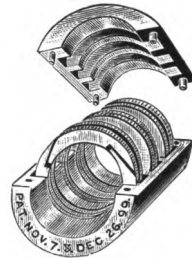
We guarantee satisfaction or expect no pay.



Nothing but metal

### What our Steam Packing will pack

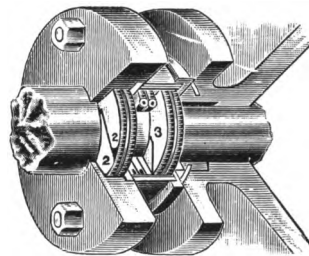
France Metal Packing will pack any round steam, air, gas and gaseous ammonia rod, any pressure, speed or temperature. Any piston rod of any type of engine or pump, whether vertical or horizontal. It will pack any valve stem, whether reciprocating or oscillating.



Inside Split Packing

### What our Hydraulic Packing will pack

It will pack any true pump rod, plunger or valve stem pumping any kind of liquid, no matter what the pressure or temperature. Any elevator rod or plunger. Any rod working in liquid.



Outside Solid Packing

### Space Required

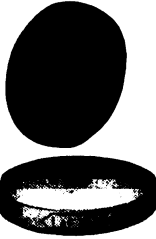
For inside split packing, the inside diameter of the stuffing box must be from  $1\frac{1}{4}$  in. to 2 in. greater than the rod diameter.

Outside packing requires 3 in. from face of stuffing box.

## LA FAVORITE RUBBER MFG. CO.

PATERSON, N. J.

**MANUFACTURERS OF PERRY'S SPECIALTIES: PUMP VALVES, VALVE DISCS, PACKINGS, GASKETS, WASHERS, ETC.**



Rubber Pump Valves

### RUBBER PUMP VALVES

Our experience in their manufacture, covers half a century. **Advantages:** The work your pump does, depends on the Valves you use. Valve formulas are accommodated to the work the Valves have to do.

They resist the action of alkaline and acid liquids, and heat and cold; insure a perfect vacuum, are noiseless, resilient and of varied density or hardness. Such an advantageous range of variation is only accomplished by the use of Rubber Valves, which speaks for their universal adoption.

It is highly important however, that the thickness be properly proportioned to the diameter of the Valve,—a customary way has been to make the thickness equal to the diameter of the stud. This can not be adhered to, as practice finds many exceptions.

The density or degree of hardness and temper, is affected by the suction, and lift as well as the pressure against which the Valve has to pump.

A table of stocks suited to all uses may be obtained on application.

### VALVE DISCS

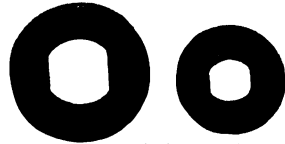
A Valve Disc suitable for the varying conditions for which valves are used, to-day must be made with the many phases borne in mind.

*Superheat* is the severest test on a composition Valve Disc; the extreme temperature renders the average Disc useless in a very short space of time—many resort to the metal seated valve of necessity, rather than choice; but where experience has familiarized the practical value of our *High Pressure Valve Discs*, they are adopted as a staple at once and always prove their efficiency.

Discs suitable for oil, acids, alkalies, gas, water, air, liquors and spirits, are also among our specialties.

It may seem strange that we make such a bid for Disc trade, (since we are not valve manufacturers) but our actual experience in making all makes of valves *stay tight*, show economical results and become minimized in the labor incident to changing and reseating has made the demand important to us.

Samples for testing will be sent on request.



Semi-Metallic Valve Discs

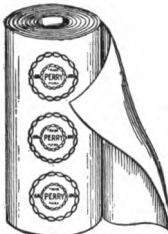
### SHEET PACKING

For general use in the average steam plant, there never has been anything produced more universally practical, than the old original Red Sheet.

We were the original producers and are still making that packing. It holds 175 pounds steam pressure without the aid of cloth or wire insertion, and with 24 mesh brass wire cloth insertion, has held 400 pounds.

We have in stock, all grades and thicknesses Red, White, Brown, Black, Asbestos Filled, Oil Proof, Acid Proof and Superheat Sheet.

Gaskets made of any of the sheet stocks may be obtained.



Perry Sheet Packing

### MARVEL WASHERS

**The Gauge Glass Economizer**

They tighten automatically with the pressure and allow expansion and contraction of glass without breakage.

### PISTON PACKING

We pack sliding rods, plungers and rotary shafts, so that scoring is prevented and the pressure is held without leakage.



Gauge Glass Washer



"Gilt Edge" Piston Packing



# THE MARTELL PACKINGS CO.

(Successor to The Metallic Packing & Mfg. Co.)

ELYRIA, OHIO, U. S. A.

MANUFACTURERS OF METAL PACKINGS FOR ALL PURPOSES

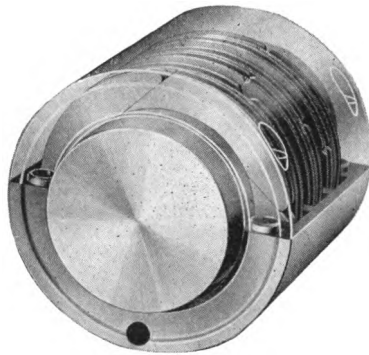
## MARTELL METAL PACKINGS

**Twentieth Century Metal Packing Rings; Safety Rings for Gas Engines; Martell Hydraulic Metal Packing for Outside Center Packed Pumps; Rings of "Ultimate Metal" for Superheated Steam; Corliss Valve Stem Packing, Etc.**

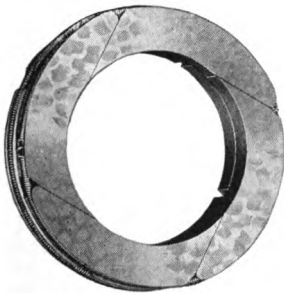
Before specifying Packing for any kind of service, you should be acquainted with MARTELL PACKINGS. Many builders of high class engines furnish MARTELL PACKING as regular equipment. They are made for modern conditions.

**Material**—Piston rod packing rings are made of special cast iron having a distinct lubricating quality. Corliss valve stem packing rings, being entirely different in form, are made of anti-friction metal. Hydraulic packing is composed of anti-friction metal, bronze and cast iron. ALL MATERIAL GUARANTEED.

**General Design**—Special attention is paid to rigidity of cases and ease of accessibility to all parts. Corliss valve stem cases are made in solid form only. The rings, however, can be placed without disconnecting any part of valve gear. Safety rings for gas engine made of "ULTIMATE METAL" are easily placed without disconnecting piston rod. "ULTIMATE METAL" is also used for superheat.

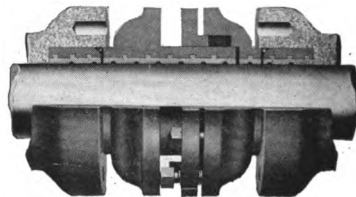


Style 316. Inside Split Case



**Packing Rings**—The joints in a ring of MARTELL Metal Packing, on diametrically opposite sides of the rod, are parallel; hence the tangent faces remain in effective contact under all conditions. This form of ring requires no clearance for wear between ends of segments. These rings float freely and easily with vibration of piston rod, are in triplicate, and any of the three pairs forms an effective packing alone. Spring tension on rings is only sufficient to maintain contact with the rod; therefore ring and rod quickly acquire a hard glaze, which renders both impervious to wear and practically eliminates friction.

The MARTELL Metal Hydraulic Packing shown on the right is for the plungers of outside center packed pumps. Our claim that same is "tight without touching" can be demonstrated to your entire satisfaction.



Packing designed for special conditions. Send for Blue Prints and catalogs.

# THE B. F. GOODRICH COMPANY

AKRON, OHIO

Offices in all principal cities

**MANUFACTURERS OF MECHANICAL RUBBER GOODS, TIRES, ETC.**

## HOSE

**WATER HOSE** covers a wide range of usage, making it quite out of the question to advance any specific recommendations as to quality.

"White Anchor," "Akron" and "Commander,"—special grades for unusual conditions of service.

"Triton," "Cascade," "Deluge,"—regular grades for all general purposes. Braided fabric water hose—in either smooth or corrugated cover.

**STEAM HOSE** must be heavily constructed to stand the pressure, and the inner lining must be so compounded as to resist the action of steam under varying temperatures.

"Goodrich,"—for high pressure. This is truly a long-life hose.

Special coverings for steam hose: Red Painted woven cotton cover, Woven Marlin Cover, Asbestos Wire-Wrapped cover.

**PNEUMATIC HOSE** wrapped duck—50' length style:

"Goodrich"—the highest quality for the hardest service.

"Akron"—the standard hose, for all general purposes.

Wire-wrapped pneumatic tool hose.

**Braided-Fabric Pneumatic Hose**—Mainstay smooth or Pinnacle Ribbed.

**AIR DRILL HOSE** is heavily constructed throughout with a layer of canvas on the outside as a protection against cuts and abrasions.

"Goodrich"—exceptionally high quality, unequalled for wear.

"Quarry"—our standard grade and biggest seller.

**BOILER WASHOUT HOSE** is made in extra heavy weight to withstand the rough service it encounters. We advocate our heavy "Boiler Washout Hose" for turbine tube cleaner work. Made in 3 grades, "Goodrich," "Safety" and "Akron."

**SUCTION HOSE** is made in a variety of grades to suit any purpose, either smooth or rough bore style.

**DREDGING SLEEVES, OIL SUCTION HOSE, OIL WELL DRILLERS' HOSE, OIL CONDUCTING HOSE, GASOLINE HOSE, SAND BLAST HOSE, COKE HOSE, MARINE DECK HOSE**, all especially adapted to the purposes for which they are made.

## PACKING

**RED SHEET PACKING**—an excellent product, in two grades.

**RED SHEET BRASS WIRE INSERTED** in the same grades.

**DIAPHRAGM AND CLOTH INSERTION:** Packing highly recommended for their proper uses.

**SUPERHEAT PACKING**, a combination of rubber and asbestos, especially adapted for high pressures.

**RED TUBULAR GASKET PACKING, SPIRAL SQUARE DUCK PACKING, ROUND AND SQUARE DUCK PACKING, SQUARE RUBBER BACK, ROUND PISTON PACKING, AND PURE GUM STRIPS** all made to supply the demand for these various kinds.

## RUBBER GASKETS

All grades and shapes. No matter what your requirements may be, we can supply them.

## "GOODRICH" RUBBER PUMP VALVES

There is no class of our product which we take greater pride in stamping with the Goodrich trade mark. Our list of grades is complete; we are always glad to give special attention to unusual conditions.

Made in grey or red rubber.

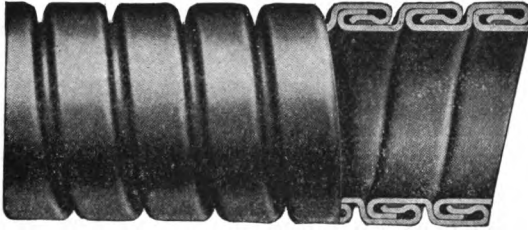
## MOLDED RUBBER GOODS

We have a large Department in our factory devoted exclusively to the manufacture of Molded Rubber articles of every description—Diaphragms, Bumpers, Springs, Cushions, Tips, Balls, Billiard Cushions, Parts for Automobiles, Truck Wheel Tires, Discs for Steam and Radiator Valves, Special Articles used in connection with the Oil Industry, Sugar Factories, Creameries, Breweries, Laundries, Rubber Parts for Plumbing Devices, Carpet Sweepers, Vacuum Cleaners, etc. A large part of this class of our business lies in the direction of strictly special articles made to customers' specifications, to meet individual requirements. Our product is of uniformly good quality and excellent finish.

## THE AMERICAN METAL HOSE CO.

WATERBURY, CONN.

MANUFACTURERS OF FLEXIBLE METAL HOSE AND TUBING FOR  
STEAM, OIL, AIR, GAS, WATER AND CONDUIT.



The "American" Interlocking Construction, BD15

AMERICAN METAL HOSE is manufactured in a variety of styles and is suitable for all the duties for which rubber hose is used. Its economy is notably pronounced in such services as conveying steam, oils, or other agents that mean short life to rubber hose. On machines of various descriptions where a flexible connection is required for carrying steam, oil, air or water, it is an admirable substitute for rigid piping and swinging or telescoping joints. It is particularly well adapted to use on presses where a constant supply of steam must be carried to the platens regardless of their position.

Our BD15 (Interlocking construction) Hose is adapted to a wide range of duties. It is made from a continuous strip of high tensile strength Phosphor Bronze or well galvanized Steel, the edges of which are turned in during the process of manufacturing to give it the interlocking construction shown in the accompanying illustration. A specially prepared asbestos cord fed into a separate groove in the strip during the winding acts as a packing and makes the Hose pressure tight. Metal hose of the interlocking type has the strength of metal, and is even more flexible than rubber hose.

Bronze Hose gives the best results for any class of work where a Hose made of Steel might rust. BD15 Hose can be used for any ordinary pressures but our BD20, which is the bare Hose covered with a braiding of Steel or Bronze wires is stronger, and is recommended in cases where the Hose is subjected to extreme pressures or excessively rough handling.

AMERICAN METAL HOSE is the only practical Hose for conducting oils, and is fast supplanting rubber hose for this class of work. We supply our BD15 Steel Hose for this service and it has astonishingly long life. Oil, not only prevents any rusting of the Steel from which the Hose is formed but by acting as a lubricant on the joints, increases the flexibility of the Hose. For loading or unloading tank cars, barges or steamers, for barrel filling and for oil feed lines on machines AMERICAN METAL HOSE has proved itself in thousands of cases a most profitable investment.

We usually furnish our Steam Hose with Iron Pipe Thread Brass Couplings attached. These are made steam tight by means of a stuffing box packed with asbestos and red lead and cannot blow off. For hydraulic work or in services where the temperatures involved are not sufficient to soften solder, we supply soldered on couplings or flanges.

Prices and full information sent upon application.

## THE A. & F. BROWN CO.

Established 1854.

Incorporated 1898.

79 BARCLAY STREET,  
NEW YORK CITY

WORKS:  
ELIZABETHPORT, N. J.

**ENGINEERS, FOUNDERS, MACHINISTS AND MILLWRIGHTS.  
MANUFACTURERS OF GEARS OF ALL DESCRIPTIONS, TURNED STEEL  
SHAFTING, PULLEYS, SPLIT PULLEYS, FRICTION CLUTCHES, SPECIAL  
MACHINERY, ETC.**

### CUT GEARS

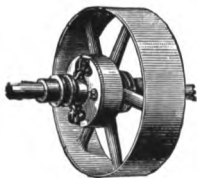
These gears are cut on the best up-to-date automatic machines obtainable, enabling this department of the shops to turn out accurately cut gears of every description and size.

### MACHINE MOULDED GEARS

The Gear Department of our foundry is fitted up with the most modern gear moulding machines, enabling us to furnish machine moulded gears up to 16 feet diameter, and 25 tons in weight if in one piece, and heavier if split, or built up. These gears are much more accurate than ordinary cast gears and are of the toughest mixture of iron.



### FRICTION CLUTCHES



The F. Brown Friction Clutch is simple, compact and having few small parts is not liable to get out of order; engages gradually and when thrown "in gear" has a stronger grip than any other, owing to the large friction surfaces and powerful operating device which is a combination of double ended (or right and left thread) screw and toggle joint.

### SIRENS

These fog signals are used by the United States Navy and Light-house Departments, also by a number of foreign governments and many steamships. They are also in use as fire alarm signals in small towns and large manufacturing plants.

### COGSWELL MILL

The problem of grinding or pulverizing many materials has been successfully solved by this machine.

### SPECIAL MACHINERY

These shops are particularly well equipped for building special machinery to plans and specifications. The pattern shop, foundry and machine shops are strictly up-to-date in all particulars and equally well equipped to turn out work of the heaviest character as well as light machinery requiring first class material and workmanship and most modern tools.

# THE EARLE GEAR AND MACHINE CO.

PHILADELPHIA

**CUT GEARS AND SPECIAL MACHINERY; LEA HIGH-DUTY CENTRIFUGAL PUMPS; LEA SIMPLEX COLD METAL SAWS**

## HERRINGBONE GEARS

For smoothness of action, high speeds, noiseless operation, wearing quality, strength and freedom from end play, Earle Herringbone Gears are superior to any other means of connecting parallel shafts. A very high ratio of speed increase can be secured without noise, undue wear or loss of efficiency.

Earle Herringbone Gears have a high efficiency because their design is correct and their workmanship accurate. Earle Herringbone Gears are interchangeable; they can be furnished in all sizes up to 7' diameter with any width of face and for any duty within their range of application.

Earle Herringbone Gears are running successfully at 6000 R.P.M. They are used on motor driven pumps and air compressors; direct connected turbo-generator sets, rolling-mill machinery, machine tools, dredges, mine hoists, ship windlasses, and similar machinery demanding noiseless operation at high speeds without vibration.

No stock list or standard size can be given because each set is separately designed to fit given conditions.

We are also prepared to furnish complete, or to machine only, *spur, bevel and mitre gears* in all sizes up to 12'-6" diameter; *worm, spiral or helical gears* up to 7'-0" diameter; and *racks* of any length or pitch, straight or curved.



## SPECIAL MACHINERY

We also design and manufacture to customers' plans and specifications, Dredge, Bascule Bridge and Lock Gate Operating Machinery; Machine Tools; light and heavy Machinery for special uses.

## LEA HIGH-DUTY CENTRIFUGAL PUMPS

For all purposes in Single Suction, Double Suction and Multi-stage Patterns with horizontal and vertical shafts, suitable for Motor, Steam Turbine, Gasoline Engine or Belt Drive. Furnished in a range of capacities adapting them for the usual classes of service for which centrifugal pumps are suitable.

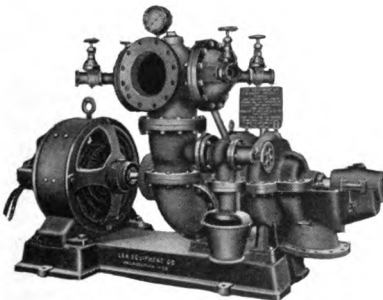
Write for our Bulletin "L" on Double Suction Volute Pumps for low heads, and for Bulletin "K" describing the Multi-Stage pumps for high pressure work.

**Underwriters' Fire Pumps:** Lea High-Duty Fire Pumps are built for fire service in accordance with the specifications of the National Board of Fire

Underwriters. They are built for the proper motor or steam turbine speed without use of intermediate gearing. Lea Fire Pumps are rugged, compact, simple in construction, have few moving parts and stuffing boxes, yield a steady pressure, and above all do not overload the motor or turbine. Standard sizes are as follows:

|                      |          |         |
|----------------------|----------|---------|
| 500 G.P.M. supplying | 2 1 1/8" | streams |
| 750 "                | 3 1 1/8" | "       |
| 1000 "               | 4 1 1/8" | "       |
| 1500 "               | 6 1 1/8" | "       |

Usual pressure is 100 lbs. Also furnished for higher pressures up to 200 lbs. Speed range 1000-1800 Revs.



Lea High-Duty Underwriters' Fire Pump,  
Motor Driven

# THE FALK COMPANY

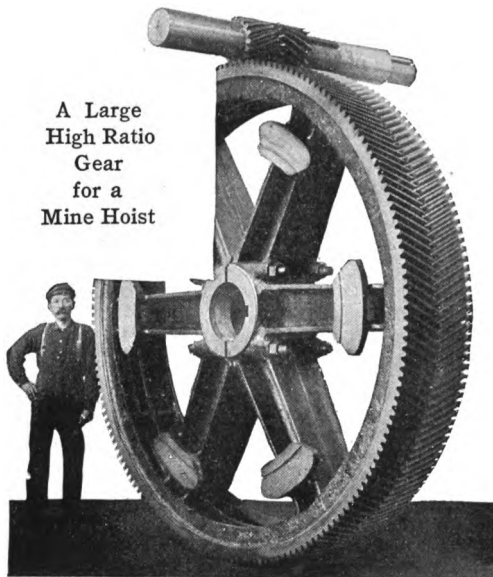
MILWAUKEE, WISCONSIN

**MANUFACTURERS OF PRECISION HERRINGBONE GEARS WITH STAGGERED TEETH (WUEST PATENTS)**

## WUEST HERRINGBONE GEARS

We manufacture a complete interchangeable system of herringbone gears, with teeth generated on special machines, designed and built exclusively for our own use.

The gears which we produce are hobbled, both sides at once, in solid blanks.



A Large  
High Ratio  
Gear  
for a  
Mine Hoist

Fig. 1

The Wuest System of staggered teeth, besides giving the maximum contact surface for a given width of face, is invaluable in securing unbroken continuity of engagement when using high ratio pinions with very few teeth.

Other distinctive features:—

Highest attainable accuracy.

Involute tooth form on *circumferential* section.

Invariable spiral angle.

Perfect interchangeability.

Equal efficiency in both directions.

Wuest herringbone gears transmit power by smooth, continuous action without jar, shock or vibration.

They are almost noiseless.

They can be used for extremely high *single* gear ratios. In this connection we make a specialty of forged pinions in one piece with their shafts. Ratios of 15 to 1 are quite normal and 20 to 1 may be used when necessary. Wuest gears can be run with safety at far higher velocities than the spur type. Special gears for use in connection with steam turbines are suitable for speeds up to 7000 feet per minute.

Referring to illustrations, Fig. 1 shows a large high ratio gear for mine hoist. Fig. 2 shows an application of high ratio gears for a large vertical triplex pump. Fig. 3 is a standard turbine gear unit forced lubrication type.

## THE FALK COMPANY

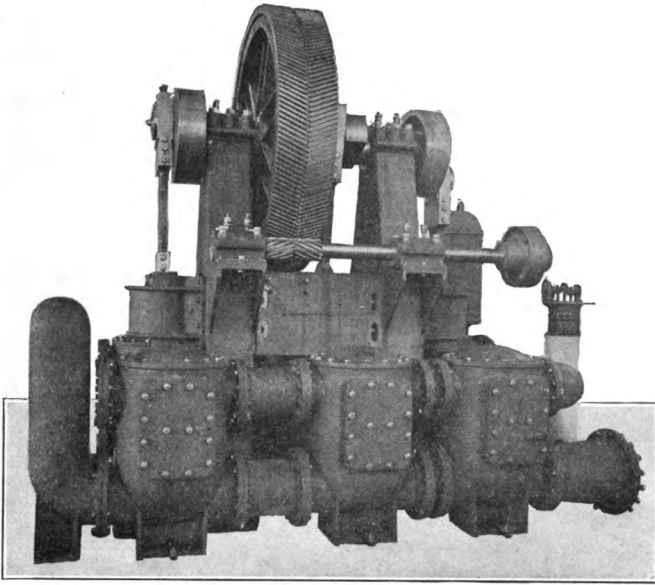


Fig. 2

### SPECIAL ADVANTAGES

- Long life.
- High efficiency (loss never exceeds 1% at rated load).
- Elimination of countershafts and double-gear trains.
- Absence of vibration with prevention of shaft crystallization and breakdown of motor insulation.
- Quiet action with durable steel pinions.

### SIZES

- Any pitch, from 10 D.P. to 1 D.P.
- Any face, from  $1\frac{1}{4}$  inches to 42 inches.
- Any diameter, from 2 inches to 12 feet.
- Machine capable of manufacturing these gears up to 16 ft. diameter, 6 ft. face and  $\frac{3}{4}$  D.P. now in course of construction.
- True spiral gears of constant angle cut to standard diametral pitch like spur gears.

The range of application for Wuest herringbone gears covers every case where spur gears are used and many new fields where spur gears are impossible.

- Specially adapted for
- Marine Steam Turbines.
- Turbo-Generators.
- Turbine-driven centrifugal pumps, mills and shafting.
- Rolling Mills and Rod Mills.
- Tube Mills and Crushing Plant.
- Power Pumps.
- Air Compressors and Blowers.
- Hoisting, Elevating and Conveying Plant.
- Rubber Machinery.
- Machine Tools.

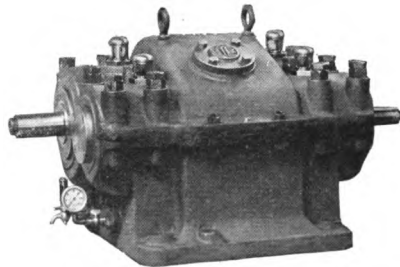


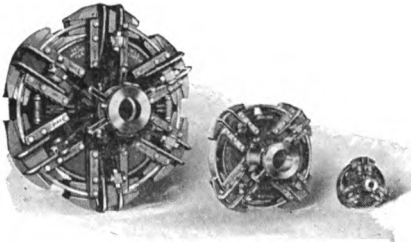
Fig. 3

## THE HILL CLUTCH CO.

CLEVELAND, O.

New York Sales Office, 50 Church St.

**A COMPLETE LINE OF POWER TRANSMISSION MACHINERY FOR BELT AND ROPE DRIVES, INCLUDING THE WELL KNOWN PATENTED HILL FRICTION CLUTCH (SMITH TYPE) AND COLLAR OILING BEARINGS.**



### HILL FRICTION CLUTCHES

(Smith Type)

The new Smith Type of Hill Clutch is the result of thirty years' experience in manufacturing Friction Clutches.

All working parts are removable without disturbing shaft, hub or pulley. Friction surfaces are positively disengaged. No springs.

Self-centering—requires no troublesome bushing in ring hub to align shafts. Toggle mechanism made of steel and forgings.

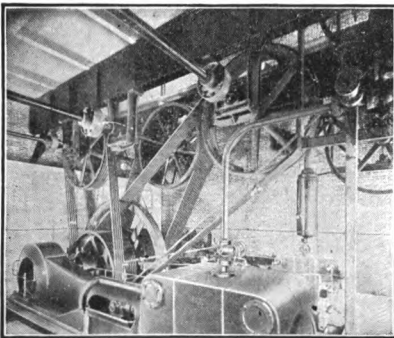
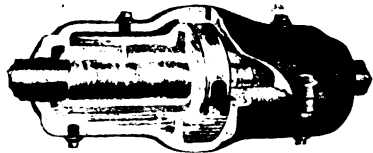
Built solid or split.

### HILL COLLAR OILING BEARINGS

Hill Collar Oiling Bearings minimize power losses. Instead of depending upon a loose ring or chain for conveying oil to the journal, a fixed collar is employed.

Oil stored in large reservoirs in bottom of the bearing is continuously and positively elevated to the top reservoirs, and then flows by gravity over the entire bearing surface.

Heavy, split oil collar clamped to the shaft also acts as a thrust collar, eliminating the necessity of outside shaft collars except in case of very severe end thrust.



### HILL ROPE DRIVES

American and English System Rope Drives designed, built and installed.

Our twenty years' experience enables us to recommend the best method of installing each individual drive to meet customers' requirements.

Preliminary information gladly offered free of charge to all contemplating the installation of new drives or changes in their present system.



## FALLS CLUTCH & MACHINERY CO.

CUYAHOGA FALLS, OHIO

NEW YORK, N. Y.  
206-208 Fulton St.

BRANCHES  
BOSTON, Mass.  
52-56 Purchase St.

CINCINNATI, O.  
134 W. Second St.

**SHAFTING, PULLEYS, HANGERS, FRICTION CLUTCH PULLEYS, FRICTION CLUTCH COUPLINGS, PILLOW BLOCKS, COUPLINGS, COLLARS, HEAVY BEARINGS, BASE PLATES, FLOOR STANDS, HEAD SHAFT HANGERS, AND ALL OTHER POWER TRANSMITTING MACHINERY**

**FALLS FRICTION CLUTCH PULLEYS AND CLUTCH CUT-OFF COUPLINGS** have been designed by forming a combination of mechanical movements, which are the acme of simplicity and strength, and represent a generation of mechanical research for obtaining the highest possible efficiency, in the saving and distribution of Power.

There is absolutely no contact of frictional surfaces when not in clutch.

They represent a high starting torque. All parts are accessible and easily adjusted, fitted with babbitted or bronze lined sleeves, which are interchangeable. These are held in position by means of cap screws, and, when worn, can easily be removed, rebabbitted and relined, and placed in position without disturbing the pulley on the shaft.

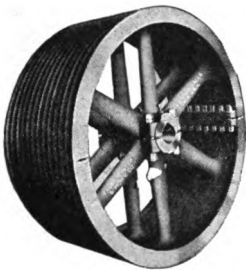


4-Arm Friction Clutch Pulley

### FALLS SYSTEM OF ROPE TRANSMISSION

The flexibility of Rope Transmission has long been recognized by Engineers as an ideal means of power distribution, which is accomplished by two distinct methods: The English or Multiple System, and the American or Continuous System. The English System is usually preferred on main drives of large units, while the American, or Continuous wrap system operates successfully from small to large loads and on long or short centers, horizontally, vertically, parallel, or at any angle to each other. On the latter system the use of Tension Carriages is essential to keep a uniform tension at all times on the rope; economy in first cost and maintenance being the initial feature.

We supply complete Equipment, and furnish Competent Engineers to design and estimate for any contemplated installation.



Rope Sheave

**CAST IRON PULLEYS AND PATENT STEEL RIM PULLEYS**, either Solid or Split, Single or Double Arm.

**HAMMERED FORGINGS** for Shafting purposes on larger diameters, and **DRAWN OR TURNED** on smaller sizes.

Complete line of **BEARINGS**, made dust-proof, Self-Oiling, Ring-Oiling, or for Grease Lubrication.

**BASE PLATES, HEAD SHAFT HANGERS, AND FLOOR STANDS**, suitable for any conditions.



Plain Pulleys

*Competent Corps of Engineers at your Service.*

## THE MOORE & WHITE CO.

ESTABLISHED 1885

PHILADELPHIA, U. S. A.

### FRICTION CLUTCHES

### FRICTION CLUTCH COUPLINGS

### FRICTION CLUTCH PULLEYS

For All Speeds

The illustrations on this page show our standard line of High-speed Friction Clutches.

Having had 29 years' experience in building Friction Clutches for all classes of work we recently put on the market a standard line of High-speed Friction Clutches to meet all requirements of leading Engineers in this and other countries.

The chief difficulty encountered with Clutches for high speed work has been the lubrication problem. We have eliminated this difficulty and made our Clutch so that it is impossible for it to throw oil due to centrifugal force. When oil is thrown from a Clutch your Belting and other materials are soon destroyed. This feature alone makes our Clutches especially adapted for use in food factories, flour mills, textile mills, paper mills and laundries.

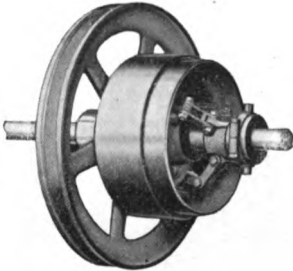
They are designed so as to meet the laws for preventing accidents. All moving parts are self-contained and free from dust or any foreign substance.

The simplicity of construction of Moore & White High-speed Clutches makes expert mechanical knowledge unnecessary to understand the principles of adjustment and operation. The discs in these Clutches are made of bronze and thereby give a longer life than wood-filled Clutches as used for ordinary service up to 400 R.P.M. All parts are interchangeable, designed for severe service, and for operating at the least possible upkeep expense.

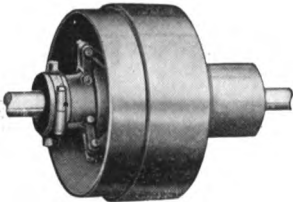
The particular advantage of all Moore & White Friction Clutches, and the reason they are used exclusively by many leading engineers, is due to their mechanical stability, starting power, simplicity.

When selecting a Friction Clutch it is well to choose one backed by a house of established reputation.

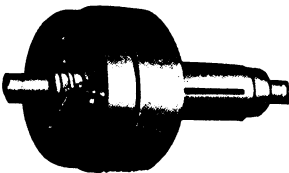
Our 1915 Friction Clutch Catalog will be published September 1, 1914. Send for your copy.



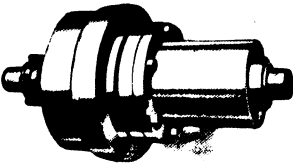
Friction Clutch Sheave Wheel



Friction Clutch Cut Off Coupling



Friction Clutch with Sleeve



Friction Clutch with Ball Bearing Sleeve

## THE MOORE & WHITE CO.

ESTABLISHED 1885

PHILADELPHIA, U. S. A.

### VARIABLE SPEED CHANGES

Arranged to give any desired variation, allowing the variation to be made without stopping the machine to change belts.

With this device, cone pulleys are transformed into plain high face pulleys which take all undue strain off the driving belt. They remove all difficulties experienced with driving belts on taper cone pulleys and the necessity of using narrow belts.

The belt contact is changed from a conical surface to that of a regular crowned face pulley so that belts of any desired width or kind may be used.

The Transformers can be made to suit cone pulleys now in operation. The Transformer consists of a flexible leather band for each cone, with the inner surface self-adjusting to cone pulley and the outer surface crowning.

The Moore & White Speed Changes dispense with friction and waste of power; there is absolutely no end thrust or wear on belt.

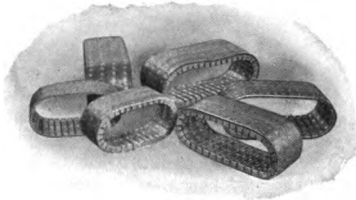
The Speed Change is theoretically and mechanically correct, and is built in a very substantial manner. The tension on the driving belt may be easily adjusted.

The variation of speed can be changed quickly by means of shifter, operated either by a hand wheel or a chain wheel. Any desired variation of speed can be secured.

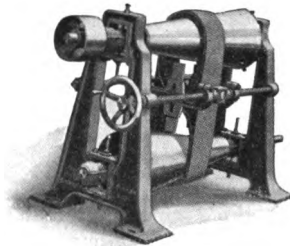
The Moore & White Speed Change was originally brought out for use in paper mills where very fine gradations of speed must be obtained while transmitting great horse power.

There are thousands of them in use today driving all kinds of machinery requiring variable speed.

Our 1915 Speed Change Catalog will be published September 1, 1914. Send for your copy.



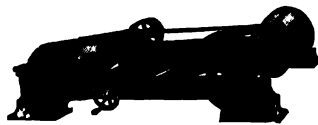
Transformers



No. 5 Speed Change



No. 2 Speed Change with Motor



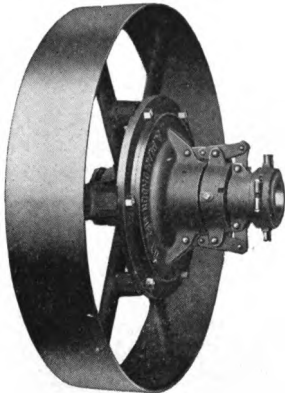
No. 7 Speed Change

## A. PLAMONDON MFG. CO.

12 TO 24 N. CLINTON ST., CHICAGO

### MACHINERY FOR TRANSMISSION OF POWER

#### PLAMONDON DISC-TYPE FRICTION CLUTCHES



Friction Clutch Pulley

Simple—powerful—no springs or bolts—one adjustment only—not affected by centrifugal action or dust.

The friction plate is lined on both sides with continuous hard maple segments and is made in halves so it can be removed for relining without disturbing other parts of the Clutch. For special conditions the friction plate may be fitted with asbestos fibre, vulcanized fibre, leather, or other friction surfaces desired, at an additional cost.

The adjustment for wear is made entirely by means of but one adjusting collar nut, giving uniform pressure on all parts of the friction discs.

This Friction Clutch can be attached to pulleys, gears, sprocket wheels, etc., and can also be used for cut-off coupling.

#### SAFETY FIRST

Factory Inspectors insist that all projecting parts of moving machinery be securely *encased*. The design of the Plamondon Friction Clutch, with all the operating mechanism located on the hub, adapts it to be made *accident proof* at a slight additional cost, by means of a cylindrical cover over the hub and toggles, thus making the clutch safe in every respect.

The Plamondon Friction Clutch with its *positive action* by means of double toggles, avoiding the use of springs, makes it *simple, powerful, positive and dependable*.

Send for Friction Clutch Catalogue No. 155

#### MACHINE MOLDED GEARS

In our process of machine molded gears, the defects attained in pattern molded gears are eliminated, as each tooth is molded separately with an accurate single tooth pattern.

In addition to our machine molded gears, we have a complete line of standard Spur, Bevel and Miter Gear patterns. We are also equipped with special machinery for planing teeth of Spur, Bevel, Miter and Angle Gears up to 18 inches width of face, and especially equipped to make *machine finished* mortise wheels and pinions of all kinds.

If interested write for Gear Catalogue No. 154



Spur Gear

#### POWER TRANSMISSION MACHINERY

We have one of the best equipped plants in this country for the manufacture of power transmission machinery, and give prompt service with highest quality.

*Shafting, pulleys, bearings, etc.*—Catalogue No. 144

# AUBURN BALL BEARING COMPANY

22 ELIZABETH STREET, ROCHESTER, N. Y.

**MANUFACTURERS OF AUBURN BALL THRUST BEARINGS, AUBURN ANNULAR BALL BEARINGS, AUBURN STEEL, BRASS AND BRONZE BALLS.**



## AUBURN BALL THRUST BEARINGS



will solve end thrust problems, prevent lost motion and eliminate renewals. They are made on the Correct Auburn Principle of the four-point cone, which gives true rolling contact between balls and races. We have solved end thrust problems for twenty years with Auburn Ball Thrust Bearings. Let us aid you in overcoming your difficulties.

### Auburn Style T-100 Ball Thrust Bearing

Auburn Style T-100 bearing is a self contained ball thrust bearing. The outside retaining sleeve is attached to the lower race of the bearing with the upper race free to rotate, yet held in place. This sleeve furnishes a protection to the balls from dust and dirt, as well as making the bearing a unit. It is a style for use in exposed places where some protection to the bearing is desired.

### Auburn Style T-114 Ball Thrust Bearing

Where there is a housing to protect the bearing this Auburn Style T-114 is desirable. It is also self-contained and a unit with the advantage of easy assembling on the machine. This is a style to use where a good circulation of oil must be had.

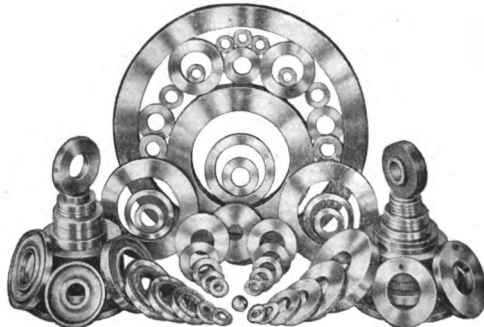
Auburn Ball Thrust Bearings are carried in stock for immediate shipment covering a range of shafts up to five inches in diameter, in light and heavy types. Larger sizes up to 26 inches outside diameter and bearings specially designed to meet unusual conditions of service can be furnished promptly.

Write today or send for bulletins

## COLLARS AND RACES

of tool steel, hardened and ground, made to customer's specifications. Send Blue-Prints of sizes today for quotation.

## STEEL, BRASS AND BRONZE BALLS



## THE HESS-BRIGHT MFG. CO.

PHILADELPHIA, PA.

MANUFACTURERS AND IMPORTERS OF ANNULAR AND THRUST BALL BEARINGS

### HB HESS-BRIGHT BALL BEARINGS DWF

are used in

Lineshaft Hangers

Machine Tools

Dynamos and Electric Motors

Trolley Cars

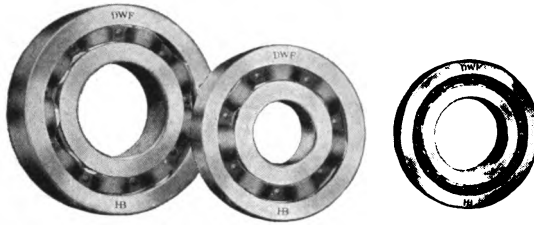
Woodworking Machinery

Flour Milling Machinery

Automobiles, etc.

Special literature on request, describing the above and other applications.

#### ANNULAR BEARINGS



HESS-BRIGHTS of "heavy," "medium" and "light" series, for same shaft size

Aside from the economy in power which they make possible, Hess-Bright Ball Bearings effect important savings in repair and upkeep charges, due to the fact that wear is virtually absent.

Made regularly in sizes up to 110 mm. (4.3307 inches) shaft diameter. Special sizes to order if quantity is sufficient.

Three series: "Heavy," "Medium" and "Light," for equal shaft sizes. Regular and high-speed types.

Hess-Bright Annular Bearings are so constructed that the sides of the races are unbroken. This fact has an important bearing on durability.

#### THRUST BEARINGS

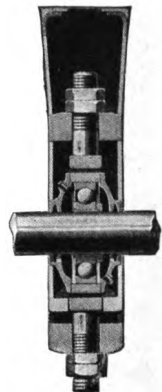
Made regularly in sizes up to 140 mm. (5.5118 inches) shaft diameter. Larger sizes on special order.

Two series: "Medium" and "Light."

One-direction and two-direction types, with or without aligning washers, though the use of such washers is recommended.



HESS-BRIGHT  
THRUST BEARINGS



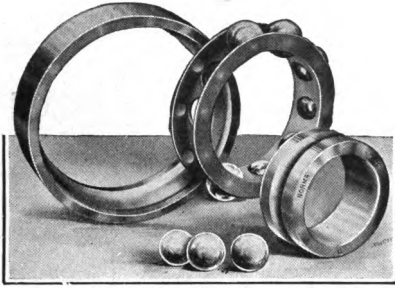
Section of Ceiling  
Hanger

Our plants are the largest in the world devoted exclusively to ball bearing manufacture, and with the extensive enlargements and improvements which we have just made (our factories now cover approximately 15 acres of floor space), we feel justified in saying that our resources and facilities for immediate delivery are unequalled.

# THE NORMA COMPANY OF AMERICA

1790 BROADWAY, NEW YORK, N. Y.

## **"NORMA" BALL, ROLLER, THRUST AND COMBINATION BEARINGS**

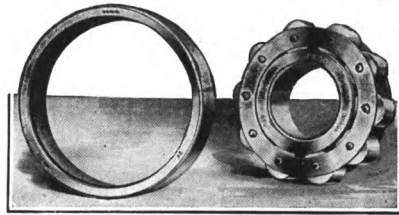


### **"NORMA" BALL BEARINGS**

Their distinctive features are:— open type, in which outer and inner races are independently mounted—an advantage in machining and assembling found in no other bearing; rigid mounting of outer race, adding to the life, efficiency and silent running; extremely high precision uniformly maintained; absolute interchangeability; high speed ball cage. All standard sizes, single and double annular. Bulletin 102.

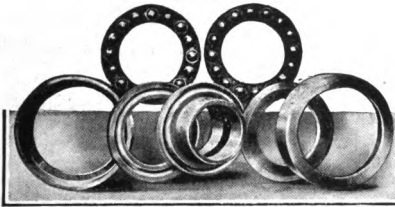
### **"NORMA" ROLLER BEARINGS**

Open type bearings with cylindrical rollers running on a convex outer race; extremely high precision giving silent-running, high speed qualities; self-aligning features; double the load capacity of a ball bearing of the same dimensions; large temporary overload capacity; especially valuable where shocks, jars and vibration must be met. Bulletin 103.



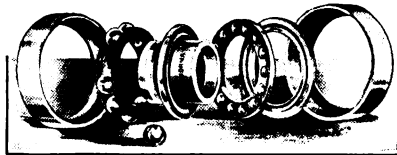
### **"NORMA" THRUST BEARINGS**

Units of high efficiency, great durability, and silent running qualities; made in both single and double thrust types, with several styles of housings as well as without any housings whatever; unsurpassed where end thrust must be provided for. All standard sizes. Bulletin 104.



### **"NORMA" COMBINATION RADIAL AND THRUST BEARINGS**

Self-contained units carrying out the "**NORMA**" idea of high efficiency, great durability, and silent running, for conditions where both radial and thrust loads must be carried; extremely compact, simplifying the problems of design and manufacture. Combined Annular and Ball Thrust Bearings, Bulletin 102. Combined Roller and Ball Thrust Bearings, Bulletin 103.



## HYATT ROLLER BEARING COMPANY

SALES OFFICE: 1120 Michigan Ave., CHICAGO

Factory, Newark, N. J.

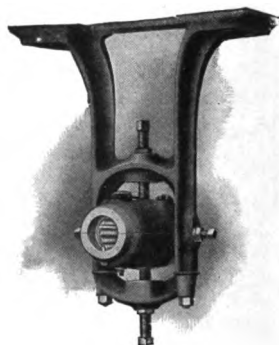
Detroit, Mich.

**MANUFACTURERS OF FLEXIBLE ROLLER BEARINGS**

### HYATT FLEXIBLE ROLLER BEARING LINE SHAFT BOXES

Actual service covering a period of over 15 years has demonstrated the Hyatt Flexible Roller Bearing pre-eminent successful for line shaft work.

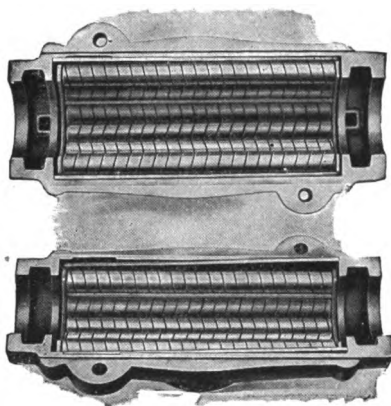
The distinctive feature of the Hyatt Flexible Roller Bearing is the roller, which is made from a strip of steel wound into a coil or spring of uniform diameter. The greatest advantage of a roller of this construction is in its flexibility, enabling it to present at all times a bearing along its entire length, resulting in a uniform distribution of load on the roller itself, as well as the surfaces on which and in which it operates. All tendency, therefore, to distortion of these surfaces is entirely eliminated, for the roller will adjust itself to all irregularities that may be present, there being no necessity for hardening the various parts of the bearing, any good steel surface satisfactorily answering all requirements.



Four-Point Set Screw

It will also be seen from its construction that the roller essentially acts as an oil reservoir, while the spiral and roller together perform the function of an oil carrier, thereby assuring perfect lubrication of all parts at all times, making it possible to operate the bearing for a considerable interval without attention.

By varying the diameter of the roller as well as the thickness, width and character of stock from which it is made, it is possible to so vary its nature as to enable it to operate under the most varied conditions, from the heaviest load on one hand to the highest speed on the other.



Halves of Split Hyatt Roller Bearing Box for Line Shafting

The box is of iron, cast in two parts and lined with steel. When assembled it is held by two large French-head screws, one at each end at opposite sides. At the top are automatic self-closing oil cups, eliminating foreign matter. At each end of the box are oil wells. A wiper is placed in the lower side, and as the oil works outward on the shaft it is caught by the wipers, and is returned to the bearings to be again taken up by the rollers.

Numerous tests have been made under all conditions of speed and load and in all classes of equipment, and in every instance have justified our claims of a saving in power from 10 to 25 per cent., depending upon local conditions.

Write for Bulletin 400E.



# HYATT ROLLER BEARING COMPANY

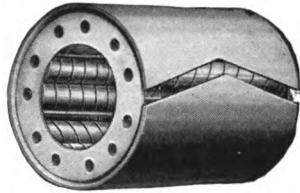
SALES OFFICE: 1120 Michigan Ave., CHICAGO

Factory, Newark, N. J.

Detroit, Mich.

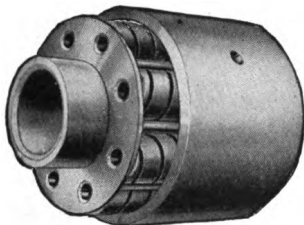
## HYATT STANDARD OR COMMERCIAL TYPE

The Standard or Commercial Type consists of a series of HYATT flexible rollers surrounding the shaft and contained in a yoke or cage. The ends of the cage are provided with slight projections, which hold the rollers in position when the bearing is not in the housing. These projections have nothing to do with operation of the bearing, serving only to make the bearing self-contained. Outer steel races or linings are furnished as a component part of the bearings of this type. The fundamental principle upon which the Standard or Commercial Type is based is that of generous bearing length,—thus reducing the load per unit section to a considerable extent,—the rollers of this type ordinarily are run directly upon the shaft or axle involved in the construction. The rollers are of a special analysis Chrome nickel steel properly heat-treated and ground accurately to size. This is an improvement recently incorporated in bearings of this type, the treated alloy steel superseding the high carbon steel formerly used. In this way the strength of the roller and hence its carrying capacity have been largely increased, and by presenting a harder surface its value has been still further enhanced, enabling it to operate satisfactorily under conditions where the previous type would have been over loaded. Write for Bulletin No. 600-B.



Commercial Type

## HIGH DUTY TYPE



High Duty Type

The HIGH DUTY TYPE was designed to differ from the STANDARD TYPE in making it possible to concentrate a greater load on the same length, or having the same load, to concentrate it on a shorter length. An improved yoke or cage is used as well as solid hardened and ground inner and outer races. These races, or, as termed, sleeves and linings, are carbonized and heat-treated to give hard surfaces for the rollers to operate on and then ground accurately to close limits both inside and out.

It is confidently believed that both from the standpoint of correct principle, thoroughness of development, as well as care exercised in manufacture, the HIGH DUTY TYPE presents a BEARING second to none, and the results obtained from over a million in daily service justify these conclusions. Write for Bulletin 305-A.

## **A. ALLAN & SON**

494 GREENWICH STREET  
NEW YORK

**INVENTORS AND SOLE MANUFACTURERS OF  
ALLAN RED METAL AND ALLAN BRONZE**

---



### **ALLAN BRONZE**

A lead-copper-tin bearing alloy with high lead and high tin content. A close grained homogeneous bearing bronze, that will give a long period of service with small loss of metal by wear; that will minimize friction and that will not have a tendency to heat rapidly, causing the bearing to hug and tear the shaft. A bearing bronze for heavy duty service.

### **ALLAN RED METAL**

A lead-copper babbitt, that will give efficiency at temperatures that would at once destroy any white babbitt metal. A bearing alloy adapted for turbine shaft packings, piston rod and valve steam packings, turbine, motor, crank pin and cross head bearings, and for facing high pressure pistons where superheated steam is used at temperatures up to 150 pounds pressure and 200° superheat.

### **PISTON ROD AND VALVE STEM PACKINGS**

Allan Red Metal ring castings for piston rod and valve stem packings, will overcome your packing troubles where superheated steam is used. (We do not manufacture stuffing box packings, we supply ring castings for same.)

### **VALVE DISCS**

Allan Metal Globe Valve Discs are metallic and will outlast many vulcanized rubber discs. Excellently adapted for superheated steam service.

### **BEARINGS AND BUSHINGS**

Allan Red Metal will not under the most severe service conditions or neglect in oiling run out of a bearing. It cannot hug, stick to, cut or scar the pin or shaft. In service the bearing takes on a highly burnished copper surface which reduces the friction and wear to a minimum. These are a few of its distinctive features which makes it the babbitt metal that can be depended upon at a critical time. Allan Red Metal cannot be melted in a ladle like white babbitt metal, but must be run down in a graphite crucible like brass. We babbitt bearings at our works for customers who have not got the facilities of a foundry.

We carry in stock bushing patterns for all I. D. and O. D. in lengths 6", 12" and 18", and supply bushings of Allan Red Metal and Allan Bearing Bronze at short notice.

## **A. ALLAN & SON**

494 GREENWICH STREET

NEW YORK

**INVENTORS AND SOLE MANUFACTURERS OF  
ALLAN RED METAL AND ALLAN BRONZE**

### **FACING HIGH AND LOW PRESSURE PISTONS**

Millions of pounds of Allan Red Metal have been used for facing H. & L. pressure pistons, with the result that to-day Allan Metal faced pistons are acknowledged by engineers as the most advanced design in piston construction. It reduces the friction and wear, overcomes scoring of cylinders, and keeps same in a smooth and polished condition. It makes the bull ring last the life of the engine and eliminates cylinder reboring. Our booklet, "The Heart of the Engine—The Seat of Power," is a treatise on piston design and covers in detail the application of Allan Red Metal to pistons. We carry in stock tons of segment castings of all size for pistons from 10" to 110" diameter.



### **ECONOMY**

You cannot expect to attain a high standard of economy in your plant if you consume a large percentage of the power produced in overcoming excessive friction in the reciprocating parts of your engines and mills any more than poor piston valve regulation.

You cannot afford to overlook the use of materials or advanced designs that tend to minimize friction, wear and the possibility of shut-down; thereby showing an efficiency, by the economy in fuel consumption, reduction in plant's maintenance cost and bearing up-keep.

### **OUR GUARANTEE**

Bearing alloys sold by us are expected to give the efficiency we claim and on which we receive your orders. If they fail, return the scrap at our expense. We will refund your money.

All our bearing alloys are made from the best brands of Virgin metals, under able mechanical and metallurgical supervision, to maintain at all times the quality and uniformity of our alloys.

For twenty-two years we have been exclusively bearing metal specialists.

# RIVERSIDE METAL REFINING CO.

CONNELLSVILLE, PA.

MANUFACTURERS OF SOLDER, BABBITT AND WHITE METAL ALLOYS;  
COPPER, BRONZE AND BRASS INGOTS

## THE OLD COKETOWN METALS



REGISTERED TRADE MARK

"Old Coketown" is on every bar of our babbitt metal. It is our registered trade-mark. Users of babbitt can depend upon the metal-bearing quality of every piece of goods that bears this stamp. We have never tried to make good goods with poor material. But we have made an effort, twenty persistent years long, to make good babbitts straight from the best of good materials.

**Babbitts:** The day has gone by when babbitt metal or other compounds can be made into a mystery. They can all be analyzed correctly. The metallurgist can, then, tell you also whether they have been rightly compounded.

**Brands: *Riverside Special.***—*Riverside Special*, while fluid enough to be used in the thinnest linings, is tough, hard and elastic. It melts very quickly, and is not easily overheated. It is designed for service on the highest revolutions per minute work.

***Riverside High Speed.***—*Riverside High Speed* combines the best qualities of soft "Genuine" and the best quality of hard "Genuine." It will stand for both high speed and heavy pressure. There is a toughness to it that gives grand service on the main bearings of high-speed engines. The metal mixture that enables it to do this is an expensive mixture. But, like a good suit of clothes, the longer wear makes up for the difference in first cost.

***Bessemer.***—*Bessemer* is designed for medium-weight heavy-pressure machinery run at moderately high speed. There is small shrinkage in cooling and it makes a smooth, clean job.

***Silver Bar.***—*Silver Bar* is the babbitt for slow, heavy rough work. An entire iron and steel plant composed of 9 and 12 in. guide mills with 6 in. bearings, run at 200 revolutions per minute, and 20 in. muck mills with 14 in. bearings, run at 50 revolutions per minute, uses *Silver Bar* exclusively.

***U. S. Standard.***—*U. S. Standard* has always come out ahead in comparative analyses of babbitts of its class. It is scientifically made from pure metals. It is the equal of many a more pretentious babbitt. It cannot be surpassed as an all-around general purpose babbitt.

***Monitor.***—*Monitor* is better than the commercial babbitt. It is fine for secondary bearings. Longer wear makes it cheaper than the common babbitts. The wise engineer will give it his preference.

**Hardware or Commercial Babbitts:** Our brands of Commercial Babbitts are made from thoroughly refined and perfectly clean metals, and can be depended on for uniformity of results.

**"Genuine."**—"Genuine" is guaranteed to be made from the original Isaac Babbitt formula.

**How Packed:** All our babbitts are packed in new boxes and are sure to arrive in first-class condition. Orders filled from twenty-five pounds up.

**Causes of Hot Bearings:** (1) A bearing improperly bedded to the journal will get heated. Hard bearings invariably heat up quicker than soft matrix bearings. The improved white metal alloy babbitts are superior in this respect to the bronzes.

(2) The soft matrix of a babbitt must receive the support of a properly compounded hard alloy in heavy service or disagreeable consequences follow.

(3) Many a properly bedded bearing that has been run to a mirror surface has been ruined by gritty lubricant or fancy grease filled with solids.

## BOSTON BELTING COMPANY

84 LINDEN PARK ST., BOSTON

100-102 Reade St.  
NEW YORK

90 Pearl St.  
BUFFALO

172 W. Randolph St.  
CHICAGO

55 First St.  
SAN FRANCISCO

105 First St.  
PORTLAND, OREGON

**MECHANICAL RUBBER GOODS: BELTING, HOSE, PACKING, ETC.**

### TRANSMISSION BELTING

Rubber Belting is perfectly uniform in width and thickness. It is not readily affected by heat or cold and is well adapted for use in damp and wet places. It is strong, durable, grips the pulleys closely and does not slip.



Brands—Excelsior Red Frictioned, Imperial stitched, Elmwood, Boston, Niagara, Trimount, Universal, Special Excelsior.

Adapted for all conditions of service; made from qualities and weaves of duck and grades of rubber which assure maximum service and economy.

**Gutta-Balata Belting;** a high-grade textile belt, adapted for power transmission, also for conveying; so constructed that belts four-ply and heavier have absolutely seamless faces, and either side can be run next the pulleys; not injuriously affected by moderate quantities of oil or grease.

### CONVEYOR BELTING

Made all widths and thicknesses, with regular rubber cover, or extra thick rubber cover on one or both sides, and reinforced edges; adapted for use on straight or troughing pulleys, for carrying coal, ores, grain, gravel, sand and other materials.

### HOSE

Rubber, for water, steam, gas, air, suction, oil and fire protection.

**Roxbro Braided Hose,** which is furnished in continuous lengths up to 500 feet, is especially recommended for pneumatic use.

**Cotton Hose,** rubber-lined, furnished in light and heavy single fabrics and medium and heavy jacket fabrics for all kinds of fire protection equipment.

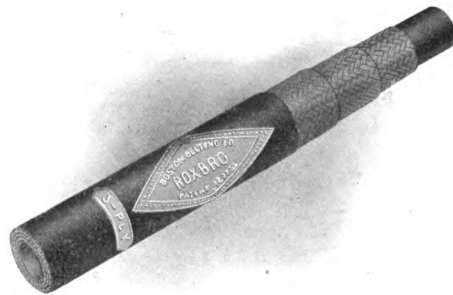
**Unlined Linen Hose,** American Underwriters; supplied in all sizes and lengths, for interior fire protection equipment. Approved by all insurance interests.

**PACKINGS;** sheet form, for flanges and joints; adapted for all conditions of service. Piston and valve rod packings, round, square and spiral; for hot and cold water and hydraulic purposes.

**RUBBER PUMP VALVES;** made in all shapes and sizes for different styles of pumps and various service conditions.

**RUBBER COVERED ROLLERS.** New Rollers Complete. Rollers Re-covered.

High-grade coverings, made from selected gums; adapted for paper and textile mill uses, tanneries, tobacco factories, and every purpose for which rubber-covered rollers are used.



## JEWELL BELTING COMPANY

Established 1848

Main Office, Belt Factory and Chrome Leather Tannery

HARTFORD, CONN.

Oak Leather Tannery, Rome, Ga.

Western Branch, 167 W. Lake St., Chicago

### LEATHER BELTING AND LACING

Our Tannery is located in the heart of the best Oak Bark producing section of the country. Our hides are all selected for the sole purpose of making them into Belting leather. Our plants are equipped with the most modern up-to-date machinery and appliances; especially adapted to the production of high-grade leather and belting at a minimum cost. We make a grade of belt suitable for any class of work from the heaviest to the lightest. Our grades follow:

#### JEWELL SPECIAL PLANER BELT

Made from center cuts of specially selected heaviest oak bark tanned hides; leather specially treated for the work it has to do; perfectly balanced; has a maximum of strength and a minimum of stretch and is fully guaranteed.

#### JEWELL EXTRA BELT

Made of center cuts of heavy oak tanned belting butts from which all shoulder and flank stock has been removed; guaranteed to weigh an average of not less than 16 ounces to the square foot; especially recommended for heavy duty and slow speeds.

#### JEWELL HARTFORD BELT

Made of the same kind and quality of leather as the Jewell Extra, like it in all respects except thickness or weight; guaranteed to weigh an average of not less than 14 ounces to the square foot; especially recommended for small pulleys and high speeds.

#### JEWELL DYNAMO BELT

Always made in doubles from specially selected pliable oak tanned leather; perfectly balanced and constructed with special reference to the work it would have to do on electrical and other machinery having small pulleys running at high speeds.

All the above grades are fully guaranteed as to every detail of material and workmanship. All are put together with waterproof cement and oil dressed at special prices upon special request.

#### JEWELL DIVER BELT

Made of the very best selected heavy oak tanned leather, put together with waterproof cement and heavily oil dressed; specially recommended for heavy duty and where there is more or less dampness and steam.

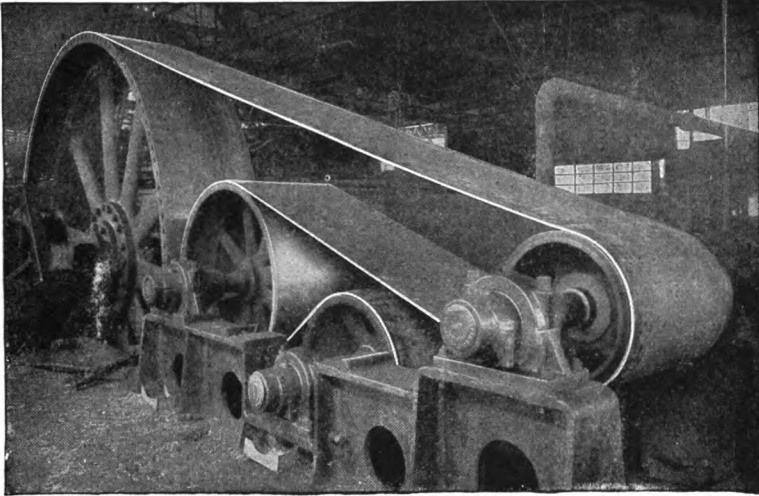
#### JEWELL ROUND BELTING

We are the largest manufacturers of Round Belting in the world. It is used on sewing machines and all other machinery where a grooved pulley is required; for bell and register cord in street cars. Our production is over ten million feet annually. It is made in all sizes from  $\frac{1}{8}$  inch to  $\frac{1}{4}$  inch.

## **JEWELL BELTING COMPANY**

### **JEWELL CHROME LEATHER**

Undoubtedly the most remarkable leather product of the Twentieth Century; tanned by a special process which produces a leather that isn't injured by the action of hot or cold water, steam, oil, gas and many acids.



48-in. 3-ply Chrome Belt transmitting up to 1900 horse power, at plant of Atlanta Steel Co. Atlanta, Ga. This Belt has already lasted four times as long as the best oak tanned belt ever used on this drive before.

### **JEWELL CHROME BELT**

The Jewell Chrome leather put together with a waterproof cement making a belt that is not affected by steam, gas, water, etc., as above stated, and in addition a belt that has the greatest possible pliability combined with the greatest tensile strength and the least tendency to stretch. It will slip less on the pulleys, transmit more power per inch of width with less loss of power than any belt known. The illustration herewith is a fair sample of what it will do.

### **BLACK JEWELL BELT LACING**

Made both in sides and cut lace; the strongest and most economical Belt Lacing known.

### **OTHER JEWELL PRODUCTS**

Other Jewell products are Agricultural Belting, Binder Straps, Trunk Straps, Skate Straps, Fan Belts, Automobile Leathers such as Brake Bands, Clutch Facings, Straps, etc., Polishing Leathers, and

### **POTTER'S PATENT BELT HOOKS**

# THE B. F. GOODRICH COMPANY

AKRON, OHIO

Offices in all principal cities

MANUFACTURERS OF MECHANICAL RUBBER GOODS, TIRES, ETC.

## BELTING

**TRANSMISSION BELTS**—Main drivers require the best quality. Weight and weave of duck, amount of stretch in service, and character of cover should be considered. We recommend the following grades:

**"Pinnacle"**—frictioned-surface, maximum strength, extreme quality.

**"Titanic"**—regular covered, extra strong and long lasting for hard service.

**"Pilgrim"**—regular covered, heavy duck, good friction and cover; for general service.

On small pulleys operating at high speed we recommend:

**"Marathon"**—a friction surface belt of highest quality, built on special woven light, flexible duck.

Light drives, such as agricultural service, are well met by **"Rot Roy,"** built on medium duck, and **"Signal,"** built on light weight duck.

**CONVEYOR BELTS** for conveying ore, coal, rock, etc., call for special qualities in the belt that have taken years of practical experience to develop. A duck of maximum strength and extreme flexibility, a strong friction, a wear-resisting cover, which will remain pliable and an edge armored against chafing are all required. We offer the following grades:

**"Longlife"**—for severe service, where extreme wear is desired.

**"Maxecon"**—for ordinary service; low priced, but reliable and serviceable.

For handling grain, packages, etc., there is so little abrasion and the conditions are so dry that belts of ordinary construction can be used. We recommend our

**"Grainbelt"**—medium weight duck, cover of usual thickness. Four plies common practice for horizontal conveyors. For bucket elevator belt service heavier plies are required—six plies standard. If heavier duck desired, we recommend **"Pilgrim"** grade.

**"Cossette" Belt**—one of exceptionally high quality throughout, for handling cossettes in beet sugar factories.

**Canning Belt**, special white sanitary cover for food canning factories.

**Grader Belt**—Recommend **"Maxecon"** with 1/32" or 1/16" top cover.

**ELEVATOR BELTS** for mines and quarries require a duck of extra strength, quality and weight to resist the tensile strains and the action of the bucket bolts. We use a special, tightly woven duck and recommend the following belts built on it:

**"Goodrich" Elevator Belt**—special high grade for most severe service, especially recommended for mining field.

**"Akron"**—high grade, designed for hard duty.

**"Sterling" Stitched**—slightly lower grade, for general conditions.

**"GOODRICH AXLE LIGHTING"** belt meets the severest service known—that of the electric train lighting from the car axle.

**POLISHING BELTS**—Sometimes called Emery Belts; built on especially strong fabric with high quality, tough friction.

We are also prepared to furnish Magnetic Take-Off Belt, Separator Belts, etc.



## MAIN BELTING COMPANY

TWELFTH AND CARPENTER STREETS, PHILADELPHIA, PA.

15 N. Jefferson St.,  
CHICAGO

309 Broadway,  
NEW YORK

33 Terminal Way,  
PITTSBURGH

205 Maritime Bldg.,  
SEATTLE

22 S. 20th St.,  
BIRMINGHAM

Represented in Canada by  
MAIN BELTING CO. OF CANADA, LTD.  
MONTREAL TORONTO

SOLE MANUFACTURERS OF LEVIATHAN AND ANACONDA BELTING



LEVIATHAN has been on the market for over thirty years. For general belt service as it occurs in the large majority of plants, LEVIATHAN has proved its efficiency. It has greater traction than leather, is more durable than rubber, more reliable than either. Under any circumstances, except those known as "belt-killing," it will give the most economical service.

ANACONDA is made of the same canvas as LEVIATHAN, but treated with another composition, which makes it water and heat proof, and highly resistive to acidity. ANACONDA belts are giving great satisfaction on many types of high speed machines.

LEVIATHAN and ANACONDA can both be used for Elevating, Transmitting, Conveying, according to the conditions stated above.

If in doubt as to which belt is needed, write our nearest office.

Our Engineering Department is at your service to help you meet the conditions that you have. This puts you under no obligations. We want your orders, but we expect them only and squarely on earning your confidence without favor.

## THE ROSSENDALE-REDDAWAY BELTING AND HOSE COMPANY

NEWARK, N. J., U. S. A.

**MANUFACTURERS OF "CAMEL HAIR" BELTING, STITCHED CANVAS  
BELTING, SOLID COTTON BELTING, ASBESTOS BRAKE BAND LINING,  
LINEN FIRE HOSE.**

### **"CAMEL" BRAND "CAMEL HAIR" BELTING**

This belt is remarkable for its great strength (almost twice that of the leather belting), long life, small slippage, minimum stretching, straight true running, and for the fact that it is less affected by dampness or acid fumes than any other kind of belting. This belting is also sold under a guarantee that it will give longer, better service than any other style of belting running under the same conditions. Made in four thicknesses as follows:

**SINGLE "CAMEL"** which corresponds to single leather or to 4-ply canvas and rubber.

**MEDIUM "CAMEL"** which corresponds to heavy single leather or to 5-ply canvas and rubber.

**DOUBLE "CAMEL"** which corresponds to double, and heavy double leather or to 6- to 8-ply rubber and canvas.

**Extra heavy "Camel"** to correspond to triple leather and all extra heavy types of belting.

### **STITCHED CANVAS BELTING "SPHINX BRAND"**

Thoroughly equal to the best on the market in this type of belts, and affords economy if substituted as follows:

8-ply in place of double leather or 5- and 6-ply rubber.

6-ply in place of light double leather or 5-ply rubber.

4-ply in place of single leather or 3-ply rubber.

10-ply where extraordinary strength is required.

Made in all weights.

### **"BLACK-BIRD" WOVEN COTTON BELTING**

**For Transmission and Conveyor Work**

An improved woven belt manufactured under high tension from the finest quality of long-staple cotton.

Impregnated with a special composition which protects the fibre, keeps the belt pliable, and prevents it from becoming hard and dry.

Will run well in steamy or wet places and on drives exposed to the weather.

### **ARABIAN "ASBESTOS BRAKE LINING"**

Especially suitable for automobile brakes. Made in all widths from one to four inches. Standard thicknesses  $\frac{3}{16}$ " and  $\frac{1}{4}$ ".

## A. LESCHEN & SONS ROPE COMPANY

Established 1857

ST. LOUIS, MO.

New York

Chicago

Denver

Salt Lake

San Francisco

WIRE ROPE FOR ALL PURPOSES

AERIAL WIRE ROPE TRAMWAYS IN VARIOUS SYSTEMS



**HERCULES  
WIRE ROPE**

(TRADE MARK REGISTERED)

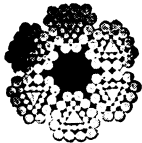
Hercules Wire Rope is made from that class of material which combines strength, elasticity, toughness and flexibility in correct proportions for maximum wire rope efficiency. It is made in various constructions to meet the working conditions of all wire rope usages of an exacting nature. It has one red strand for identification purposes.

We also manufacture high grade Plow Steel, Crucible Cast Steel, Special Steel, Swedes Iron and Galvanized Steel and Iron wire ropes.

Recognizing the importance of correct construction, we make wire ropes in all the usual types as well as special constructions for individual conditions. Among such ropes are:

### PATENT FLATTENED STRAND CONSTRUCTION

Patent Flattened Strand rope is so made that the outer wires conform to a circle, so instead of only one wire in each strand being exposed to frictional wear there are from two to six, depending upon the style of construction. This distribution of wear allows smaller wires to be used, which results in extreme flexibility.



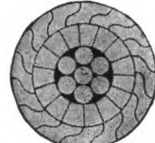
Cross Section  
Patent Flattened  
Strand  
Hoisting Rope

This construction also affords greater strength, as the shape of the strands permits them to fit snugly together, thereby allowing more metal to be used in a given diameter.

### LOCKED COIL CONSTRUCTION

For Heavy Track Cable Service

This type of rope consists of a succession of layers or coils, the surface layer being interlocking. The compactness of Locked Coil rope provides great strength and presents maximum resistance to crushing tendencies. Its smooth bearing surface reduces wear and minimizes vibration.



Cross Section  
Locked Coil  
Cable  
for Tramways

Descriptive catalogs gladly furnished upon request



**JOHN A. ROEBLING'S SONS CO.**

TRENTON, N. J.

**WIRE ROPE OF ALL KINDS****ROEBLING**

We manufacture and keep in stock at our works at Trenton and at warehouses, at agencies and branches in large cities wire rope made from Swedish Iron, Cast Steel, Extra Strong Cast Steel, Plough Steel and Improved Plough Steel.

We give below tables of strengths, etc., for the standard constructions of IMPROVED PLOUGH STEEL ROPE. The rope is also furnished with 6 strands of 37 wires each and with 8 strands of 19 wires each.

This rope is recommended as the best to use where extreme conditions tend to bring extraordinarily severe stresses, and is particularly well adapted to resist abrasion.

The hemp center of this rope is colored blue to distinguish it from other wire ropes.

A copy of our catalogue, giving information about other wire ropes, and wire rope fastenings will be mailed on application.

**IMPROVED PLOUGH STEEL HOISTING ROPE**

Composed of 6 Strands and a Hemp Center, 19 Wires to the Strand.

| Trade Number. | Diameter in inches. | Approx. circumf. in inches. | Approx. weight per foot. | Approx. strength in tons of 2000 lbs. | Proper working load in tons of 2000 lbs. | Dia. of drum or sheave in feet advised. |
|---------------|---------------------|-----------------------------|--------------------------|---------------------------------------|--|---|
| 00            | 2¾                  | 8¾                          | 11.95                    | 315                                   | 63                                       | 11                                      |
| 0             | 2½                  | 7¾                          | 9.85                     | 263                                   | 53                                       | 10                                      |
| 1             | 2¼                  | 7¼                          | 8                        | 210                                   | 42                                       | 9                                       |
| 2             | 2                   | 6¾                          | 6.30                     | 166                                   | 33                                       | 8                                       |
| 2½            | 1¾                  | 5¾                          | 5.55                     | 150                                   | 30                                       | 8                                       |
| 3             | 1¾                  | 5½                          | 4.85                     | 133                                   | 27                                       | 7                                       |
| 4             | 1½                  | 5                           | 4.15                     | 110                                   | 22                                       | 6½                                      |
| 5             | 1½                  | 4¾                          | 3.55                     | 98                                    | 20                                       | 6                                       |
| 5½            | 1½                  | 4¾                          | 3                        | 84                                    | 17                                       | 5½                                      |
| 6             | 1¼                  | 4                           | 2.45                     | 69                                    | 14                                       | 5                                       |
| 7             | 1¼                  | 3½                          | 2                        | 56                                    | 11                                       | 4½                                      |
| 8             | 1                   | 3                           | 1.58                     | 45                                    | 9  | 4                                       |
| 9             | ¾                   | 2¾                          | 1.20                     | 35                                    | 7  | 3½                                      |
| 10            | ¾                   | 2¼                          | .89                      | 26.3                                  | 5.3                                      | 3                                       |
| 10¼           | ¾                   | 2                           | .62                      | 19                                    | 3.8                                      | 2½                                      |
| 10½           | ¾                   | 1¾                          | .50                      | 14.5                                  | 2.9                                      | 2¼                                      |
| 10¾           | ¾                   | 1½                          | .39                      | 12.1                                  | 2.4                                      | 2                                       |
| 10a           | ¾                   | 1¼                          | .30                      | 9.4                                   | 1.9                                      | 1¾                                      |
| 10b           | ¾                   | 1½                          | .22                      | 6.75                                  | 1.35                                     | 1½                                      |
| 10c           | ¾                   | 1                           | .15                      | 4.50                                  | .9                                       | 1¼                                      |
| 10d           | ¾                   | ¾                           | .10                      | 3.15                                  | .63                                      | 1                                       |

**IMPROVED PLOUGH STEEL ROPE**

For Haulages and Transmissions. 6 Strands and a Hemp Center, 7 Wires to the Strand.

|    |    |    |      |     |     |    |
|----|----|----|------|-----|-----|----|
| 11 | 1½ | 4¾ | 3.55 | 90  | 18  | 11 |
| 12 | 1½ | 4¼ | 3    | 79  | 16  | 10 |
| 13 | 1¼ | 4  | 2.45 | 67  | 13  | 9  |
| 14 | 1¼ | 3½ | 2    | 52  | 10  | 8  |
| 15 | 1  | 3  | 1.58 | 42  | 8.4 | 7  |
| 16 | ¾  | 2¾ | 1.20 | 33  | 6.6 | 6  |
| 17 | ¾  | 2¼ | .89  | 25  | 5   | 5  |
| 18 | ¾  | 2½ | .75  | 20  | 4   | 4¾ |
| 19 | ¾  | 2  | .62  | 17½ | 3.5 | 4½ |
| 20 | ¾  | 1¾ | .50  | 13  | 2.6 | 4  |
| 21 | ¾  | 1½ | .39  | 11  | 2.2 | 3½ |
| 22 | ¾  | 1¼ | .30  | 7¾  | 1.5 | 3  |
| 23 | ¾  | 1½ | .22  | 6½  | 1.3 | 2½ |

## THE CONVEYING WEIGHER CO.

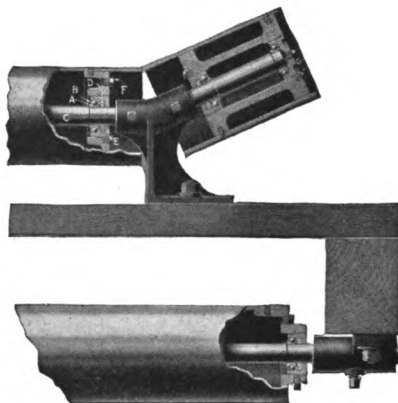
90 WEST STREET, NEW YORK, N. Y.

**BALL BEARING BELT CONVEYORS; CONTINUOUS, AUTOMATIC SCALES FOR BELT AND OTHER CONVEYORS; CONVEYING AND HOISTING MACHINERY; COMPLETE MATERIAL HANDLING PLANTS; TRUMP MEASURING AND MIXING MACHINES; TRUMP CONCRETE MIXERS.**

### BALL BEARING BELT CONVEYORS

We illustrate herewith the construction of ball bearing troughing and return idlers for belt conveyors. It is guaranteed that if a belt conveyor running level be equipped with these idlers, there will be a saving of 40% in power required. These idlers having felt oil-retaining washers need to be lubricated only once in two years.

- A Hardened steel "Cone" fitted on turned steel shaft
- B Pressed steel "Ball Retainer"
- C Turned steel shaft, set screwed in Idler brackets
- D Oiled washer of felt or carded wool
- E Hardened steel "Plug" screwed into pulley hub
- F Brass plug for lubrication
- G Lock screw to prevent hardened plug from turning

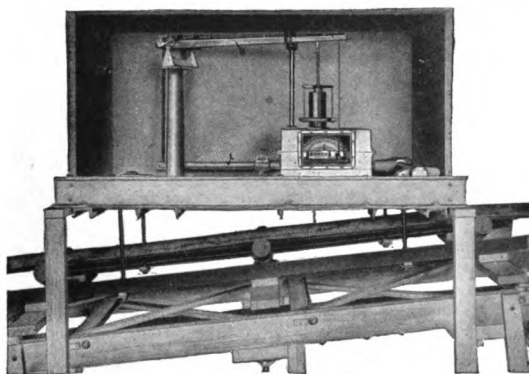


"Conweigh" Ball Bearing, troughing, and return idlers for belt conveyors (patents pending)

### THE MERRICK CONVEYING WEIGHER

This device records the weight of material handled on belt conveyors, bucket conveyors, cable railways and overhead trolleys or telfers. The weigher consists of a pair of weighing levers and a steelyard of special design so that a short section of the conveyor can be suspended from the weighing levers. The extreme end of the steelyard is connected with a totalizing mechanical integrator which

derives its other factor from the travel of the conveyor by means of suitable gearing from a bend pulley on the return belt, or a sprocket wheel if on a bucket conveyor. This integrator continuously totalizes the product of two quantities, one proportional to the weight of material suspended and the other to the travel of this material. The result therefore represents the total weight of material and is plainly indicated by a register.

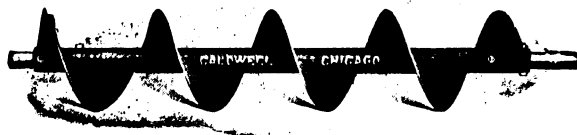


View of Conveyor Weigher. Front Sheet of Casing Removed

## H. W. CALDWELL & SON COMPANY

CHICAGO, ILLINOIS

**ELEVATING, CONVEYING AND POWER TRANSMITTING MACHINERY**



### HELICOID CONVEYOR

Sole manufacturers of "HELICOID" SCREW CONVEYOR.  
Made of one continuous strip of metal without lap or rivets.  
Mounted on standard and extra heavy pipe or solid shaft.

### GEARS

Machine Molded Teeth or Cut  
Teeth, Spurs, Bevels, Miters, Mor-  
tise Wheels, 1" to 6" pitch.



### CHAIN

Standard Malleable Detachable  
Special, Steel Chains for all pur-  
poses.



### SPROCKET WHEELS

With Chilled Rims and Teeth  
for hard service.

### ELEVATOR BUCKETS

Salem, Caldwell Avery made of Steel, also Special Steel Buckets of all kinds made  
to order. Malleable Buckets for stone, coal and gritty materials.

### STEEL WORK

Elevator Casings, Conveyor Troughs, Spouting Tanks, Pan Conveyors, Ele-  
vator Boots.

Belt  
Conveyors  
for stone,  
sand, grain,  
coal, etc.

Send for  
catalogue  
No. 38

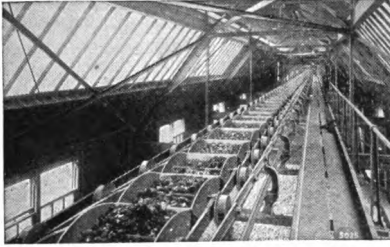


Pulleys,  
Fly Wheels,  
Shafting,  
Bearings,  
Friction  
Clutches,  
etc.

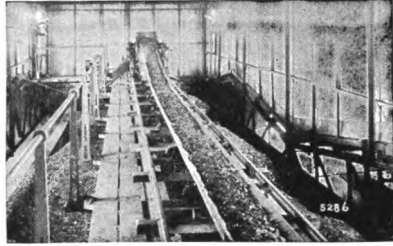
## LINK-BELT COMPANY

PHILADELPHIA CHICAGO INDIANAPOLIS

**ELEVATING AND CONVEYING MACHINERY FOR EVERY PURPOSE.  
POWER TRANSMISSION MACHINERY.**



**Peck Carrier**



**Belt Conveyor**

Original Ewart Link-Belt, > Flint-Rim < Sprocket Wheels, Manganese Chains, Link-Belt Silent Chain Drives, Power Transmission Machinery, Pillow Blocks, Friction Clutches.

Coal Storage Plants, Wholesale and Retail Coal Yards, Coal Tipples, Coal Washeries, Car Hauls, Crushers, Screens, Picking Tables, Chutes, etc.

Bridge Tramways, Locomotive and Gantry Cranes, Telfers, etc.

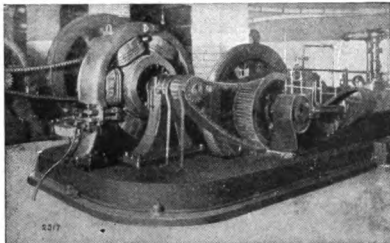
Power House Equipment: Peck Carriers, Belt Conveyors, Coal Bunkers, Telescoping Ashes Elevators.

Locomotive Coaling Stations, Cinder Stations, Complete Freight Handling Equipments.

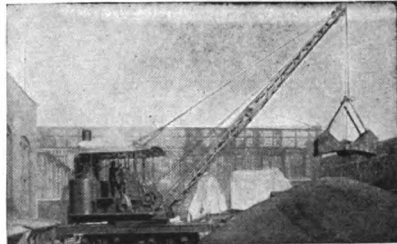
Package Handling Machinery, Store Service Conveyors.

20th Century Portable Asphalt Paving Machine, Portable Wagon and Truck Loaders, Portable Bag and Box Piling Machines.

### **SPECIAL CATALOGS DESCRIBING THE ABOVE UPON REQUEST**



**Link-Belt Silent Chain Drive**



**Locomotive Crane**

## WELLER MANUFACTURING CO.

CHICAGO, ILLINOIS

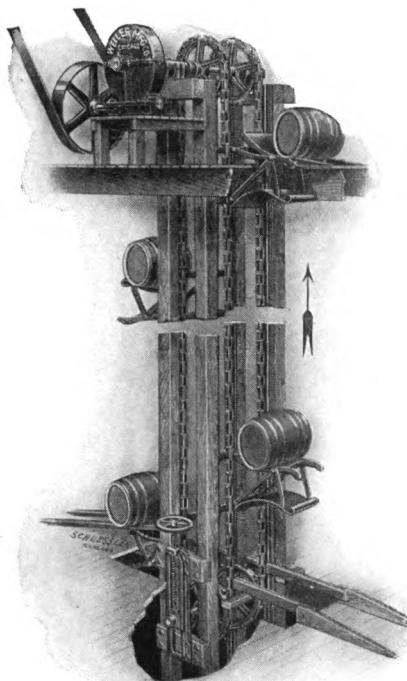
**ENGINEERS, FOUNDERS, MACHINISTS AND SHEET METAL WORKERS.  
MANUFACTURERS OF ELEVATING, CONVEYING AND POWER TRANSMITTING MACHINERY. COMPLETE GRAIN ELEVATOR EQUIPMENTS.**

The complete catalogue of the Weller Manufacturing Co., covering a complete line of elevating, conveying and power transmitting appliances, comprises a volume of about 600 pages. In the following list and illustrations we have endeavored to indicate the range of our activities in these lines.

Angle Plates for bevel and miter gears  
Apron Conveyors  
Barrel Elevators  
Bearings, ring oiling, chain oiling, self oiling, collar oiling  
Belt Tighteners  
Belting, rubber, canvas, leather  
Blocks, tackle  
Buckets, elevator  
Cars, steel dump  
Chain, case hardened steel bushed, combination steel and malleable, detachable lock pintle, etc., etc.  
Clutches, friction, square and spiral jaw  
Collars, safety set  
Conveyors, belt, spiral, endless chain  
Couplings, compression, flanged face, universal  
Dump Cars  
Elevator Appliances, including Buckets, Boots, Heads, Legging both Steel and Wood, Power Shovels, etc., etc.  
Fans, for elevator heads, steel plate exhaust  
Friction Clutches  
Friction Hoists  
Friction Wheels  
Gears, spur, bevel, cogs, worm, etc.  
Grease Cups  
Hangers, drop, post  
Hoists, American Safety rope, double drum, Moore anti-friction chain, single drum friction  
Jack Screws, locomotive  
Link Belting and attachments  
Manila Rope Transmission appliances  
Oil Burners  
Paper Frictions  
Perforated Metal  
Pillow Blocks  
Pipe, plain riveted, spiral riveted  
Power Shovels  
Pulleys, cast iron, head, friction clutch, steel split, wood split, etc.  
Screens, for Sand, Gravel, Stone, Ore, Coal, etc.  
Shafting  
Sheaves, manila rope transmission, wire rope transmission, wire rope hoisting  
Sprocket Wheels  
Spur Rack and Pinion  
Take-up Boxes  
Tension Carriages  
Trippers for Belt Conveyors  
Winches, hand and power  
Wire Cloth

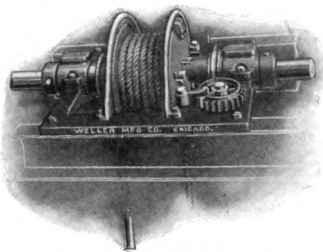


## WELLER MANUFACTURING CO.

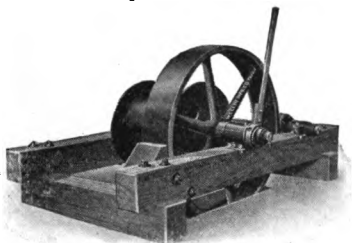


**Barrel Elevator**

Will elevate and lower goods at the same time, automatically delivering them from either up or down leg.



**Weller Improved Power Shovel**

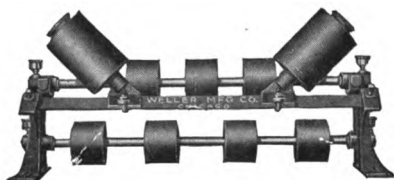


**Friction Hoist**



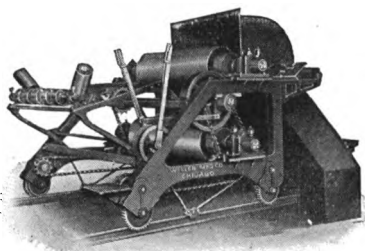
**Spiral Screw Conveyor**

Our standard is the Cold Rolled Sectional Flight Conveyor. Interchangeable with all Standard makes. Sizes from 3 to 18 ins. diameter, capacities 65 to 6000 bu. per hr.

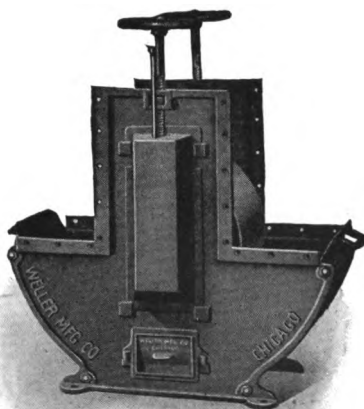


**Belt Conveyor Troughing Rolls**

Our line of Belt Conveyor equipment is now exceptionally complete. Successful and economical handling of a wide variety of materials can be accomplished in one or more methods.



**Self-Propelling Two Pulley Tripper**  
High Pattern, with Trailer



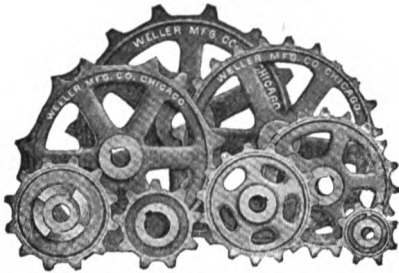
**Standard C. I. Elevator Boot**

For wood and steel legging. Gates in both ends and hand-holes in the sides facilitate cleaning.

(Continued on next page)

(Continued from preceding pages)

## WELLER MANUFACTURING CO.

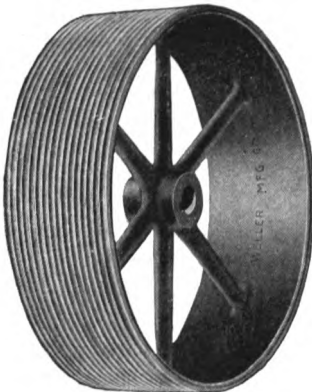


**Sprockets**

Wheels are bored, set-screwed or key-seated as ordered. We furnish Wheels with chilled teeth and rims in sizes not exceeding 24 in. diameter.



**Gears**

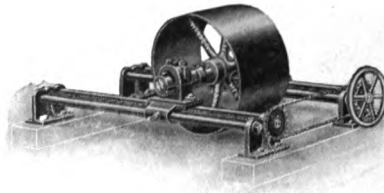


**Sheaves**

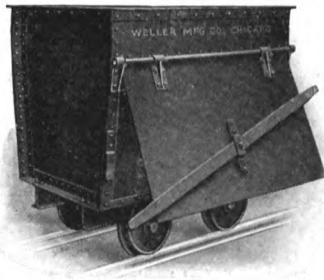
We have superior facilities for the manufacture of Manila Rope Sheaves and other appliances used in connection with Rope Transmission. Our Sheaves are heavy and well proportioned, the grooves being accurately turned and polished.



**Pulleys**



**Belt Tighteners**



**Steel Dump Cars**

For Stone, Ore, Coal, Ashes, etc. Built in various styles for all purposes.



**Pillow Blocks**

Adjustable Ball and Socket Drop Hangers and Pillow Blocks, with Plain, Capillary Ring or Collar Oiling Bearings.



**Hangers**

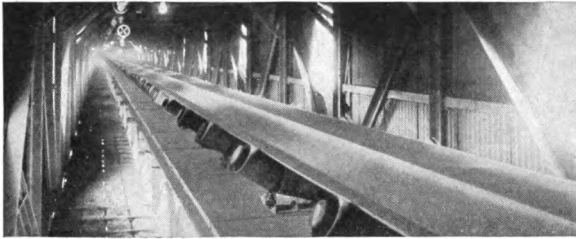
## ROBINS CONVEYING BELT CO.

PARK ROW BUILDING, NEW YORK

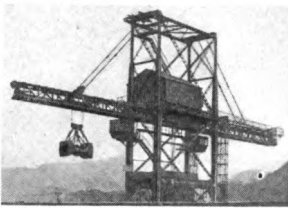
CHICAGO OFFICE: Old Colony Building, SAN FRANCISCO: The Griffin Company. SPOKANE: United Iron Works. TORONTO: Gutta Percha & Rubber, Limited. NEW GLASGOW, NOVA SCOTIA: Eastern Steel Company, Ltd.

**CONVEYING, ELEVATING, HOISTING, STORAGE, RECLAIMING AND ORE-BEDDING MACHINERY**

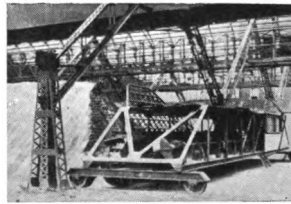
**Robins Patent Conveyor Belt**



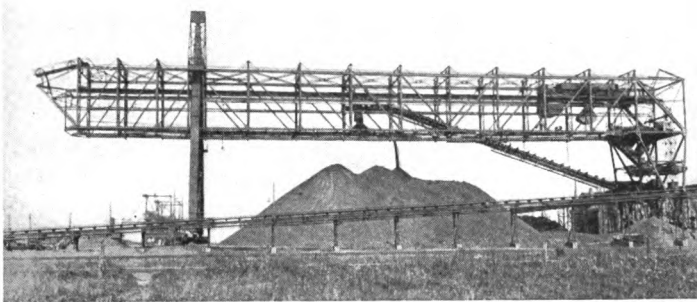
**Belt Conveyors**



**Unloading Machinery**



**Ore Bedding and Reclaiming Machinery**



**Storage and Reclaiming Machinery**

*Write for a set of our bulletins.*

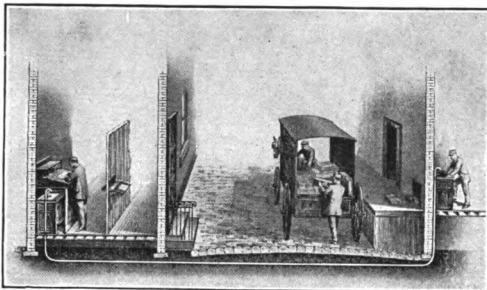
## THE LAMSON COMPANY

BOSTON, MASS., U. S. A.

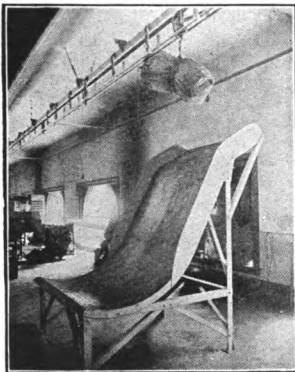
**PNEUMATIC TUBES—CASH, PARCEL, MESSAGE, AND MAIL CARRIERS;  
AUTOMATIC, SWEEP-OFF, PICKUP AND SELECTIVE CARRIERS; BELT  
CONVEYORS, TRAY CONVEYORS, SMALL LIFTS, ELEVATORS, ETC.**



**Desk Station 4" Mail Tubes in Private Office**



**Carrying Documents Between Buildings**



**Automatic Mail Bag Carriers**

### **PNEUMATIC DESPATCH TUBES**

Designed and installed for all Office, Factory, Warehouse, Postal or Store Service requirements. Vacuum, Pressure, Vacuo-Pressure, Unit, "Two-way," Shifting Current or "Steam-jet" types in sizes of tubes ranging from  $2\frac{1}{4}$  in. to 8 in. diameter. Latest Power-saving inventions. Over 50,000 stations of Lamson Tubes in use.

### **FOOT POWER PNEUMATIC TUBES**

No power plant required, operated by foot pressure. Efficient for lines up to 200 feet in length. Speaking tube attachments at small additional cost.

Sizes  $2\frac{1}{4}$  and 3 inch O. D.

### **SELECTIVE CARRIERS**

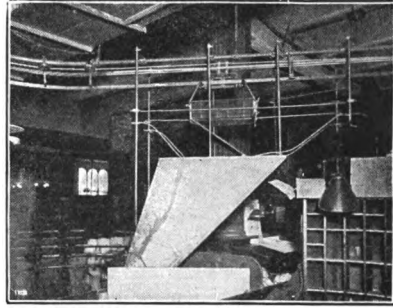
Entirely automatic—pick up a load at any point and deliver it at any desired station.

Made in any size to meet requirements—from carrying single sheets of paper to heavy bags of mail.

## THE LAMSON COMPANY

### AUTOMATIC SWEEP-OFF AND DELIVERY CARRIERS

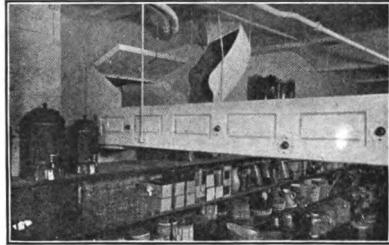
Constantly moving Baskets traveling on circuit lines and arranged to Sweep off Mail, Documents or Parcels from shelves and dump them into receiving chutes at required Receiving Stations. Made in Standard sizes as used by U. S. and Foreign Post Offices, or to Specifications.



Lamson Sweep-off and Dump Carriers for Post Office Work

### LAMSON BELT AND TRAY CONVEYORS

All sizes for all conditions of Mail, Merchandise or Parcel Carrying. Special Conveyor Belts to carry Trays are built with Arresting Stations by which a constant supply of material is automatically maintained at each Station. Particular attention to complete Belt Conveyor Systems for assembly of "Send," "C.O.D." and "Transfer" Parcels in large Department Stores.



Store Service Belt Conveyor and Chute Showing Self-closing Fire Door

### PICK-UP AND DELIVERY CARRIERS

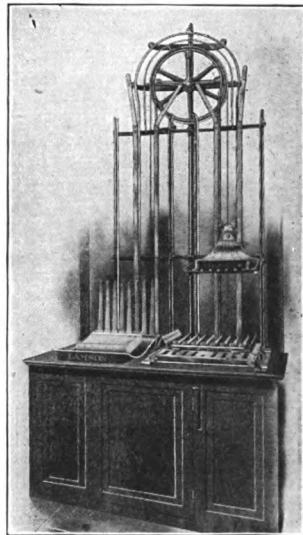
Constantly moving metal "fingers" that noiselessly pick up documents or small articles from one tray or station and deliver them at another as desired. Made in standard sizes to meet special requirements.

### SPECIAL CONVEYORS

Made to meet any demand for assembly and distribution of Mail or Merchandise within or between buildings.

Plans and Estimates Free.

*Representatives in all Principal Cities.*



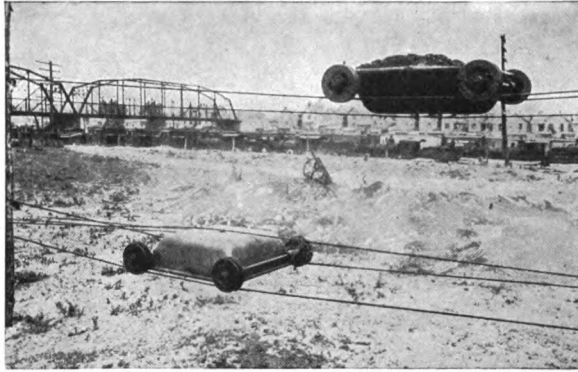
Will pick up at any station and deliver at any other station

## CONSOLIDATED TRAMWAY COMPANY

61 BROADWAY, NEW YORK

SHOPS AT ROANOKE, VA.

MANUFACTURERS OF THE LAWSON LOOP-LINE TRAMWAYS



Going Full, Returning Empty

### THE LAWSON AUTOMATIC TRAMWAY

Exemplifies the last word in the SCIENCE OF SHORT HAUL. It does everything better than any other tramway; many things which it does can be done by no other tramway.

It is semi-automatic in loading.

It is fully automatic in discharging.

It is operated by one man at the loader only.

It can be extended to any number of miles by relay sections.

It is indifferent to grade or curvature and follows any profile.

It discharges its load at regular intervals and in uniform amounts.

By an ingenious device the car in dumping clears itself of every kind of material, however soft or sticky.

If required, it transports in either direction, loading and dumping at either end of the route.

*Unlike every other tramway its cable wear and other maintenance is almost nominal:* this statement is hard to believe, but is, nevertheless, a fact.

Its capacity is anything from 10 to 100 tons per hour.

It handles ore, coal, culm or slack, crushed stone, gravel, sand, clay, cross-ties, tan bark, logs, lumber, staves, merchandise, boxes, cotton bales, sugar-cane, or any other material—including people.

It takes a minimum of power to operate it.

It has handled ore for a year, including loading, transporting and dumping, for an average of 3c. per ton taken from the books.

Being portable and in small units, it can be removed, changed in length, relocated and rebuilt as often as desired;—hence a contractor makes it a part of his plant.

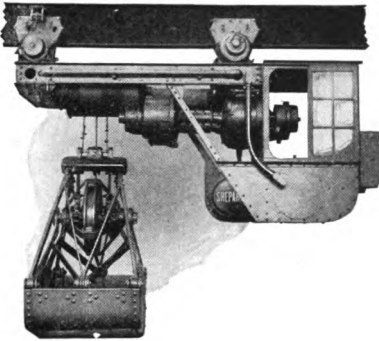
Notwithstanding all this IT IS THE LOWEST IN FIRST COST OF ANY TRAMWAY ON THE MARKET.

Send for our various Bulletins which are fully illustrated. After reading them tell us your problem. As Short-Haul Engineers, we will then recommend the proper lay-out and tell you what it will cost to install and to operate.

# **SHEPARD ELECTRIC CRANE & HOIST CO.**

MONTOUR FALLS, N. Y.

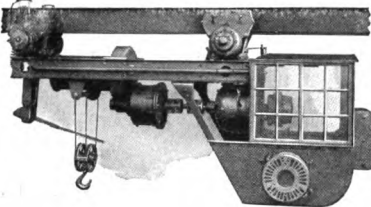
**DIRECT AND ALTERNATING CURRENT CRANES AND HOISTS FOR  
EVERY SERVICE**



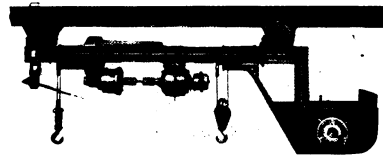
**Form 13.—Grab-Bucket Type**



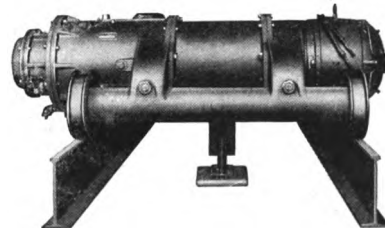
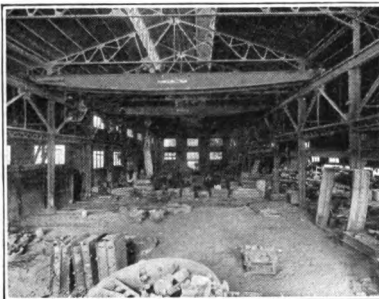
**Form 1.—Single I-Beam Type**



**Form 21.—Single Hook Monorail Type**



**Form 12.—Double Hook Monorail Type**



**Form 6.—Standard Type Crane Trolley**

## **Special Features**

Thorough enclosures—Constant automatic lubrication—Self aligning bearings—Balanced Drive—Machine work as good as machine tools.

## **List of Bulletins**

Bulletin 61 on Cranes; Bulletin 60 on Monorail Hoists. Electric Hoist Handbook.

# THE ALLIANCE MACHINE CO.

ALLIANCE, OHIO

NEW YORK

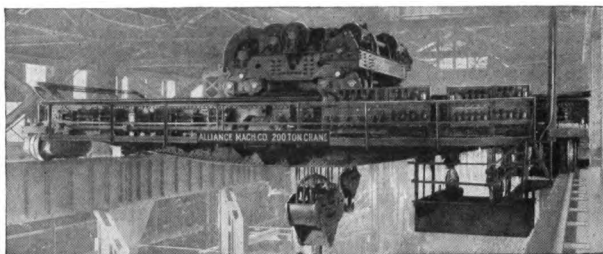
PITTSBURGH

CHICAGO

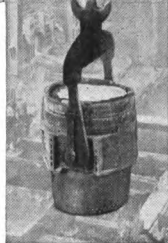
BIRMINGHAM

## ENGINEERS AND BUILDERS OF

**ELECTRIC TRAVELING CRANES AND MACHINES OF ALL TYPES FOR ALL PURPOSES; I-BEAM HOISTS; ORE BRIDGES; ROLLING MILL AND HYDRAULIC MACHINERY, RIVETERS, STEAM HAMMERS, HEAVY PUNCHES AND SHEARS; COKE PLANT MACHINERY, SCALE CARS AND CHARGING LARRIES; COPPER CONVERTING MACHINERY**



The accompanying cut shows a 200-ton Electric Traveling Crane designed and built by us for the Carnegie Steel Co.'s Homestead Works, for the Open Hearth and Armor Plate Department. This crane is probably the



largest single trolley electric traveling crane in service and is illustrated here to show the capacity of our works for producing large machinery. We make a specialty of cranes for steel works and heavy industrial service.

## ELECTRIC TRAVELING CRANES AND MACHINES

**Ladle Cranes  
Soaking Pit Cranes  
Stripper Cranes  
Bucket Cranes**

**Charging Machines  
Gantry Cranes and Ore Bridges  
Coke Pushers  
Coke Levelers**

The general features of our electric cranes are as follows:

Cranes are so designed so that all working parts are readily accessible.

M. C. B. type bearings are used on both trolley wheels and bridge wheels.

All gearing is steel and have cut teeth excepting in the larger cranes where the drum wheels and pinions are shrouded.

End carriages and trolley sides are of box section type.

All bridge girders are uniformly of the box section type.

Mechanism is so constructed that in order to lower the load the motor must be operated in the lowering direction. It is entirely enclosed and runs submerged in oil; thus insuring perfect lubrication at this important point.

Each hoist is equipped with an automatic electric brake operated by solenoids and so connected up that when the hoisting motor is in operation, the brake is always held out of contact, or should the current fail or be cut off, the brake immediately applies itself and holds the load.

The bridge motion mechanism is equipped with a powerful foot brake so as to enable the operator to stop the crane without reversing the motor.

Practically all of our cranes are equipped with special flexible steel hoisting crane rope having six strands and thirty-seven wires to the strand.

All hooks on our cranes are forged steel and each hook is provided with an ample size ball bearing for easy rotation.

Sheaves and drums on our cranes are thirty times the diameter of the rope.



# THE BROWN HOISTING MACHINERY COMPANY

CLEVELAND, OHIO

NEW YORK: 50 Church St.

PITTSBURGH: Oliver Bldg.

CHICAGO: 208 S. LaSalle St.

SAN FRANCISCO: Monadnock Bldg.

Colby Engineering Co.: PORTLAND, ORE.

## MANUFACTURERS OF BROWNHOIST EQUIPMENT

**COAL AND ORE HANDLING MACHINERY**—Bridge tramways, fast plants, cantilever cranes, gantry cranes, furnace hoists, larries, transfer cars, bins, car tipples, and pig iron breakers. These machines are designed for the rapid handling of material and a long service. They are installed in many parts of the world.

**LOCOMOTIVE CRANES**—Eight and four-wheel and for any gauge track; speediest locomotive crane built; equipped with M. C. B. couplers, standard trucks and fittings, steam brake, all steel gears; can be fitted with either a bottom-block, any kind of bucket, shovel attachment, magnet or piledriver, all interchangeable in a short time; easily operated; fitted with steam or electric power or with an internal combustion engine.

**BUCKETS**—Grab buckets, two and single rope; drag line buckets; contractors' clam shell buckets; slag buckets, and tubs. The designs of these buckets are such that they get a full load each time and are under the control of the operator at all times. The best of material is used throughout, giving strength and durability to the spades, bearings, and digging edges.

**TRAMRAIL SYSTEMS**—These systems handle all the material overhead, reaching every floor in each building and as much yard space as desired. We install the systems complete using the well-known Brownhoist trolleys, which are recognized as the standard trolleys. Operated by electric or other power.

**ELECTRIC HOISTS**—DC and AC. Designed especially for a hard service at maximum rated capacity, and for safety. The load is suspended entirely from steel parts. All gears are enclosed in a cast iron casing which contains a large supply of oil. These hoists are made in various capacities.

**FREIGHT HANDLING EQUIPMENT.** This includes several different machines designed for handling the freight at a much reduced cost over the present methods. The freight is handled overhead from car to sorting platform, warehouse, wagon or other cars. It requires just a few men, eliminates confusion and costly mistakes, and increases the terminal capacity.

**FERROINCLAVE.** A patented corrugated sheet steel used as a reinforcement for concrete. It requires no forms during erection, and is easily laid by the workmen. It is used for concrete roofs, floors, bins, walls, partitions, silos, bridges, stairs, etc.

We also make overhead travelling cranes, work-car cranes, jib cranes, pillar cranes, bridge cranes, cableways, crabs, winches, transfer tables and water-closet shields.

*Catalogs and prices furnished on request*

## CLYDE IRON WORKS

29th AVENUE WEST, AND MICHIGAN ST., DULUTH, MINN.

**HOISTING ENGINES, DERRICKS AND DERRICK FITTINGS, ELECTRIC HOISTS, BELT DRIVEN HOISTS, AUTOMATIC BUCKETS**

---

### HOISTING ENGINES AND BOILERS OF CLYDE-GRADE

Our product is used for all kinds of Contractor's work, Dredging, Pile Driving, Railroad and Bridge Building, Quarries and general hoisting purposes. We also make a specialty of engines for skidding and loading logs, and for general logging operations.

All our engines are thoroughly tested under steam as well as by the usual hydrostatic test. All parts are made from standard jigs and templates and are absolutely interchangeable.

### ONE, TWO, THREE, AND FOUR DRUM HOISTING ENGINES

In our 235 page catalog we illustrate the 2099 types and sizes of our standard engines with single or multiple drums, and single or double cylinders. These hoisting engines are regularly built with or without boiler, winch and sheave heads, and reversing gear. Clyde hoists of 7 x 10 and larger are built with all-steel gears.

### DERRICKS AND DERRICK FITTINGS

In this large catalog we also illustrate and list a complete line of timber derricks and fittings. All usual conditions can be met with some one of our standard styles, but we are prepared to build derricks for any special conditions that may arise. For this purpose we maintain a force of draftsmen and engineers who are specialists in this line, and their experience of many years is at the disposal of our customers.

Clyde Derricks are designed with great care to withstand violent strains. Every possible point of weakness, both in the fittings and in their action on the timbers, has been guarded against and we claim our fittings to be the strongest on the market for the size of timbers for which they are intended.

Following is a partial list of our standard styles of derricks:

|                                    |                                  |
|------------------------------------|----------------------------------|
| Standard Guy Derricks              | Hand Power Stiff Leg Derricks    |
| Half Hand Power Guy Derricks       | Clam Shell Stiff Leg Derricks    |
| Hand Power Guy Derricks            | Full Circle Stiff Leg Derricks   |
| Clam Shell Guy Derricks            | Self-Propelling Derrick Cars     |
| Standard Stiff Leg Derricks        | Self-Contained Portable Derricks |
| Half Hand Power Stiff Leg Derricks |                                  |

We also manufacture a complete line of logging machinery, of land-clearing machinery and of excavating machinery, including the FIELD TOWER EXCAVATOR for levee-building and drainage-canal digging.

# THE MARION STEAM SHOVEL CO.

Station D, MARION, OHIO

NEW YORK

SAN FRANCISCO

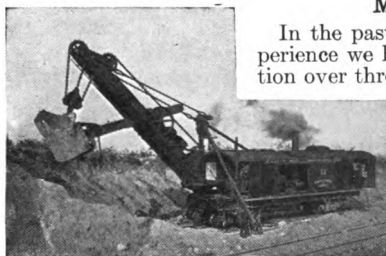
ATLANTA

SEATTLE

CHICAGO

**BUILDERS OF EXCAVATING MACHINERY OF EVERY DESCRIPTION; RAILROAD AND REVOLVING STEAM SHOVELS; ELECTRIC AND TRACTION SHOVELS; DIPPER, ELEVATOR AND HYDRAULIC DREDGES; SCRAPER-BUCKET EXCAVATORS; BALLAST UNLOADERS; RAILROAD DITCHERS; LOG LOADERS.**

## MARION STEAM SHOVELS



**Model 100 Stripping Iron Ore**

In the past three decades of our manufacturing experience we have built and placed in successful operation over three thousand steam shovels. The primary feature of the Marion Shovel is that it contains the highest class of materials and workmanship, and is especially designed and constructed for heavy duty, uninterrupted service and maximum returns on the investment involved.

**Distinctive Features:** Interchangeable parts; side-swinging jack arms; balanced throttle with lowering control; swinging chains or wire cables attached directly to boom; Manganese steel shipper shaft pinions and dipper handle racking; Manganese steel dipper fronts and open-hearth steel backs; all castings subjected to severe strains of basic open-hearth steel; open-hearth steel machine-cut gears.

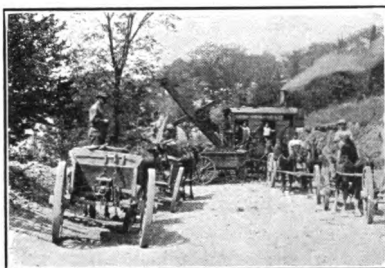
**Marion Railroad Shovels** are built in eight different sizes, with capacities of  $\frac{3}{4}$ ,  $1\frac{1}{2}$ ,  $2\frac{1}{4}$ , 3,  $3\frac{1}{2}$ , 4, 5 and 6 cubic yards. These shovels are suited to heavy digging such as is found in rock work, iron mines, heavy shale, etc.

**Marion Revolving Shovels** are built in three sizes, with capacities of  $\frac{5}{8}$ , 1 and  $1\frac{1}{2}$  cubic yards. These machines may be mounted either on railroad or traction wheels. They are suited to street and road construction, sewer and trench excavation, cellar and basement, gravel and stone quarries, and to all work of a not too heavy nature.

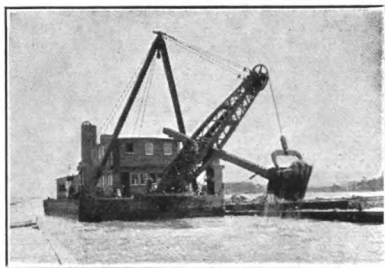
**Marion Stripping Steam Shovels** are built in several suitable sizes and they are adapted to stripping overburden from coal, stone, phosphate rock and other material that lies from ten to forty feet below the surface of the ground.

**Marion Scraper Bucket Excavators** are suited to a great many classes of work that cannot be economically handled by either a steam shovel or dredge. They are particularly adapted to work where it is necessary to effect a wide and deep cut and convey and dump the material onto a spoil bank or into cars or wagons at a single operation.

**Marion Dredges** are suited to all kinds of excavation under water: rivers, harbors, canals, dikes, trench and irrigation ditches, etc.



**Reducing a Grade with a Five-Eighths Yard Revolving Marion Shovel**



**Deep Water Dipper Dredge**

We will welcome the chance to give you full detail.

## C. W. HUNT COMPANY, INC.

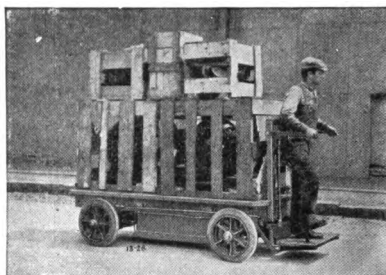
WEST NEW BRIGHTON, STATEN ISLAND, NEW YORK

New York City Office: 45 Broadway

**COAL AND ASH HANDLING MACHINERY, PIVOTED BUCKET CONVEYORS, HOISTING AND CONVEYING MACHINERY, CABLE AND AUTOMATIC RAILWAYS, STEEPLE TOWERS, SKIP HOISTS, INDUSTRIAL RAILWAY EQUIPMENTS, ELECTRIC LOCOMOTIVES, MOTOR CARS, STORAGE BATTERY INDUSTRIAL TRUCKS, TRANSMISSION AND HOISTING ROPE, SPECIAL SCALES AND WEIGHING HOPPERS, COAL CRACKERS**



Single Door Charging Car

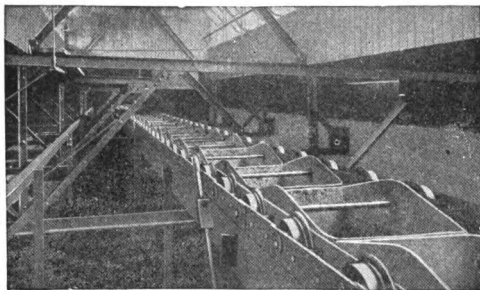


Storage Battery Industrial Truck

### **INDUSTRIAL RAILWAYS AND CARS AND STORAGE BATTERY INDUSTRIAL TRUCK**

The boiler room cars for bringing coal to boilers are so designed that the labor of firing is reduced to a minimum, and the boiler room is kept clean. We design all types of cars for use in foundries, machine shops and all kinds of manufacturing plants. The use of outside flanged wheels permits one man to push a one ton load on a sharp curve. Ask for catalog U-12-1 on "Industrial Railways."

The Storage Battery Industrial Truck is designed to take the place of hand trucks, has a capacity from 2000 to 4000 lbs; is simple and reliable. Catalog U-13-4 on request.



### **PIVOTED BUCKET CONVEYORS**

consist of a series of independent swinging buckets free to dump in either direction. Conveyors can run in any direction, the buckets hanging in an upright position, therefore dry or liquid material can be handled. The peculiar system of driving by

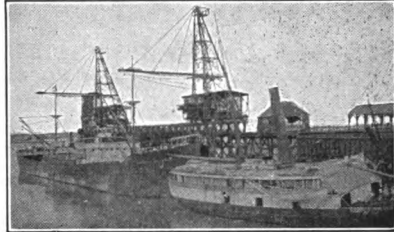
a pawl relieves the conveyor wheels of all stress. Ask for catalog U-12-9 on Conveyors.

## C. W. HUNT COMPANY, INC.

WEST NEW BRIGHTON, NEW YORK

### HUNT STEEPLE TOWERS

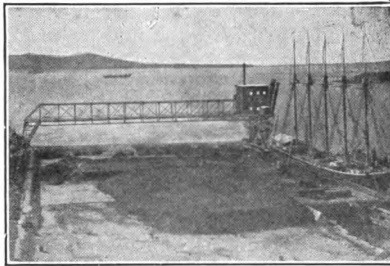
are designed to be operated by one engineer. One engine is required for hoisting the steam shovel and another for running the trolley on the booms. Great speed makes these outfits especially suited to rapid unloading of vessels. The projecting booms are usually hinged to swing horizontally over the wharf. Where obstructions such as the rigging of vessels interfere, the booms can fold up in a vertical plane. Capacity of buckets ranges from  $\frac{1}{2}$  to  $2\frac{1}{2}$  tons.



Hunt Steeple Towers

### HUNT TRANSPORTING BRIDGES

are adapted to the storage and reclaiming of coal over large areas. The one shown has a four-drum equalizing engine and operates with grab buckets at a capacity of 120 tons per hour. Furnished in capacities up to 600 tons per hour.

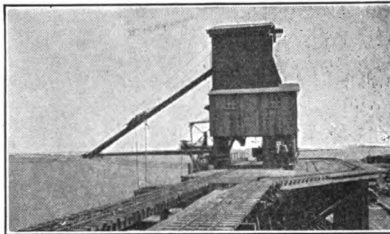


Hunt Transporting Bridges

### INCLINED BOOM HOISTING ELEVATORS

are for rapid and economical hoisting of materials from vessels. The bucket, whether large or small, is carried from the hold of the vessel to the dumping place every trip in exactly the same course, and at any rapidity demanded. The bucket is carried exactly where wanted, rising vertically from the hold to the boom, running up the boom, and dumping at a fixed place.

These elevators are proportioned to suit the work and for use either with tubs or grab buckets. The lighter size is especially adapted for coal or ore hoisting, using any size bucket up to one-ton capacity.



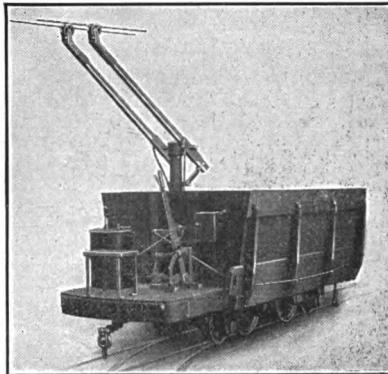
Inclined Boom Hoisting Elevators

### HUNT MOTOR CARS

#### Self-Dumping

made in many types, capacities up to 10 tons, and are equipped with motors and overhead trolleys or shoes for third rail as desired. Suitable for transporting coal, fertilizer materials, ores, and other bulk materials.

General catalog U-102 on request.

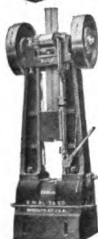


Hunt Motor Cars  
Self-Dumping

## E. W. BLISS CO.

BROOKLYN, N. Y.

### SHEET METAL WORKING MACHINERY    CAN-MAKING MACHINERY DROP-FORGING MACHINERY



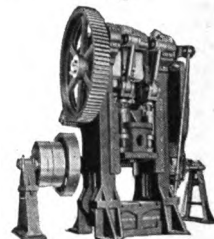
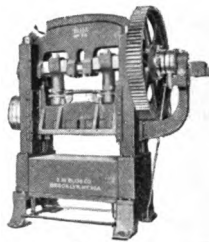
The most complete line of machines for sheet metal working in the world.

Presses for every ordinary kind of work and special machines for unusual requirements. Drop Forging machinery, Hinge and Butt machinery, Fork and Spoon machinery, Expanded Metal Lath machinery, Shovel machinery, Horse Shoe machinery, Minting machinery, Automobile Parts machinery, Spinning Lathes, Gang Slitters, Circle Shears, Perforating, Punching, Slitting, Shearing, Beading, Flanging, Crimping and Seaming machines.

Complete equipments for the economical manufacture of Petroleum and Alcohol Cans, Fruit and Vegetable Cans, (Sanitary and Packers'), Meat Cans, Paint and Varnish Cans, Lard Pails and Butter Tins, and all kinds of Tin Cannisters, Boxes and Packages.

Machinery for manufacturing Soft Metal Tubes, Tinware, Enamelware, Aluminum, and Silverware, Metal Shingles, Metal Ceilings, Sheet Metal Furniture, Kitchen Utensils, Kitchen Boilers, Oil Stoves, Lamps, etc., etc.

We are also equipped for die work of every description.



Catalogues describing any of our lines will be sent on request.

- |  |   |
|--|---|
| No. 1. "Bliss" Inclined Power Presses.                         | No. 10. "Bliss" Machinery for Manufacturing Pieced Tinware.   |
| No. 2. "Stiles" Power Punching Presses.                        | No. 12. "Bliss" Machinery for Manufacturing Electrical Parts. |
| No. 3. "Bliss" Straight-Side Power Presses.                    | No. 13. "Bliss" Drop Forging Machinery.                       |
| No. 5. "Bliss" Toggle Drawing Presses and Spinning Lathes.     | No. 14. "Bliss" High Speed Automatic Can Making Machinery.    |
| No. 6. "Bliss" Foot and Screw Presses.                         | No. 15. "Bliss" Railway Motor Gears and Pinions.              |
| No. 8. "Bliss" Double Crank Presses.                           | No. 16. "Bliss" Machinery for Manufacturing Automobile Parts. |
| No. 9. "Bliss" Machinery for Manufacturing Tin Cans (Spanish). |   |

## SEAMAN, SLEETH COMPANY

PHOENIX ROLL WORKS

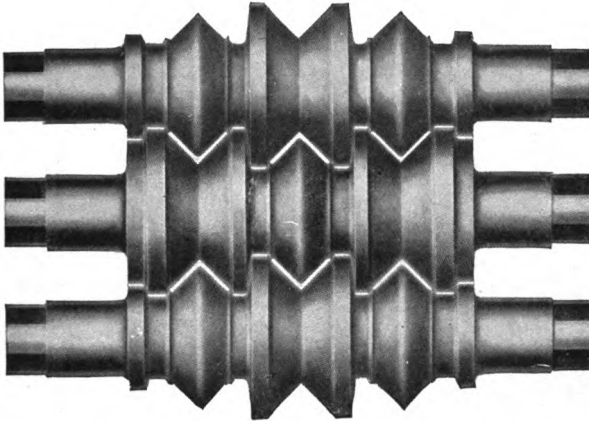
PITTSBURGH, PA.

**MANUFACTURERS EXCLUSIVELY OF PATENT SEMI-STEEL CHILL  
AND SAND ROLLS AND PINIONS; STEEL ROLLS AND PINIONS**

### **ROLLS AND PINIONS FOR ROLLING MILL MACHINERY**

We have prepared a catalogue for users of rolls for all purposes, to show our facilities for getting out work, and therefore with our practical experience of fifty-three years in casting, finishing and designing rolls, as is generally known, we are able to design and finish rolls for any purpose to the entire satisfaction of the trade.

Our foundries, two in number, are under one management and are equipped for casting rolls of all sizes and for all purposes. All small rolls are made in No. 1 Foundry up to and including sheet tin plate and semi-steel rolls for all purposes. Semi-steel being our improvement and patented in 1871 has been in constant use and since the patent expired has come into general use. No. 2 Foundry is intended for our heavier roll castings, such as are used for rails, structural work, chilled plate rolls, etc.



**Three-high Equal Angle Finishing Rolls—Steel, Semi-steel, Sand or Chill Pass**

We guarantee the working of all rolls we design, whether it is one pair or one set or the entire equipment of a mill. We do not build mills, however, as we have found that the manufacture and finishing of rolls should be a special branch of trade, conducted by special men trained in that particular line. This induced us in 1870 to make a specialty of rolls, being the first in the world to do so. Previous to this we had a general foundry. We have the necessary trained men and superintendents, and with our plant as shown and described in our catalogue, together with a list of mills given which we have supplied with rolls when they were built, and to whom we refer all parties intending to build as to results obtained on said mills, you can readily see our advantage.

Besides the mills listed in our catalogue, there are a large number of others whom we have supplied, and the bulk of our trade to-day is in supplying rolls, rough or finished, to the general trade. By furnishing us a sketch of what is wanted, we will be pleased to design rolls to roll it, and further, parties coming to our office can see thousands of drawings of special or regular sections. We invite you to come to see us.

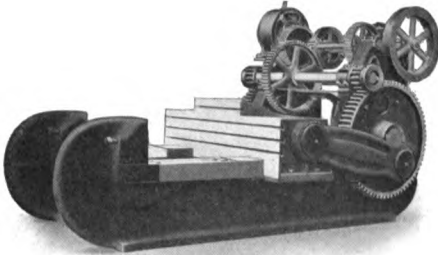
## WILLIAMS, WHITE & CO.

MOLINE, ILLINOIS, U. S. A.

PITTSBURGH OFFICE  
808 House Building

CHICAGO OFFICE  
933 Monadnock Block

### FORGING, PUNCHING AND SHEARING MACHINERY COALING STATIONS



Bulldozer

#### THE ORIGINAL BULLDOZERS

Nearly forty years of manufacture. A Bulldozer is a high powered, long stroke Horizontal Press with exceptionally large die surfaces, used principally for forming and bending. Used for an incredible number of purposes,—they are the most general purpose press in existence. The ingenuity of the die maker has an unlimited field here. Up-setting is done very satisfactorily with an automatic die; punching and shearing of special shapes also.

Large numbers are used by the steel car companies, railroads and agricultural implement concerns, etc.

Many improvements have recently been made.

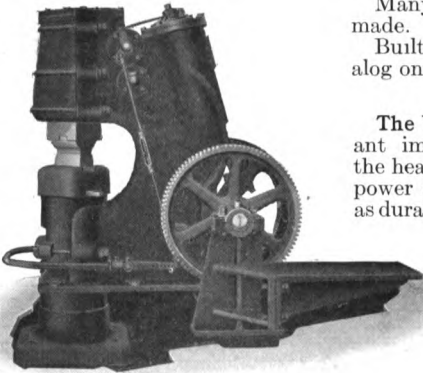
Built in ten sizes and two types. Catalog on application.

#### HAMMERS

**The Yeakley Hammer:** Recent important improvements place this hammer at the head of all forging hammers,—both in power and control. The output, as well as durability, is extraordinary. Exceptionally large die surfaces. Speed is maintained,—forging both light and heavy. Let us tell you more about this hammer and the recent improvements.

The following sizes are built:  
40 lb., 80 lb., 150 lb., 400 lb.  
and 600 lb.

Readily adapted to motor drive.



Yeakley Hammer

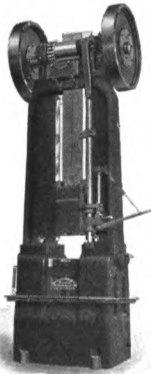
**The Justice Spring Hammer:** Is a well known type. Fine control. Silico Manganese Steel Springs furnished.

**The "Moline" Helve Hammer:** There is a certain class of work for which the Helve Hammer is particularly suited. Details furnished on application.

**Board Drop Hammers:** The feature of these hammers to which we call particular attention is the exceptional ease of operation and large output. In all respects these hammers are up to the highest standard.

**Crank (or Rope Lift) Drop Hammers:** These hammers stand very severe service with comparatively small up-keep and attention. While not adapted to fine drop forgings they are particularly adapted to the carrying of large dies for bending, shaping, forming and straightening.

We make three styles of Lifters: Sandage, Ratchet and Peck.



Board Drop Hammer



## WILLIAMS, WHITE & CO.

### MULTIPLE PUNCHES

These machines constitute one of our largest lines. We make nine sizes with a variety of lengths and throats. Many special types and adaptations for special work are furnished. See our special double row punching outfit for steel car work.

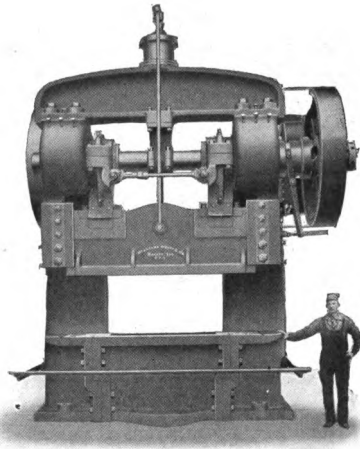
One of our customers alone has more than thirty of the No. 32 size. The larger sizes are used more particularly for steel car work.

These machines range in weight from 5000 lbs. to 250,000 lbs.

They are used for multiple punching of bars, plates, I-beams, channels, angles, car sills, etc., etc. Also for shearing and pressing. For the latter work a vertical adjustment is desirable.

The purchaser should furnish complete details of requirements.

Gate Shears: We make a complete line of Gate Shears for shearing plates.



Multiple Punch

### PUNCHING AND SHEARING MACHINES

Regular "C" Type Double and Single End Machines, Open Fronted Bar Shears, Guillotine Shears, Gate Shears, Coping and Structural Punches and Shears

We make a complete line of the above machines.

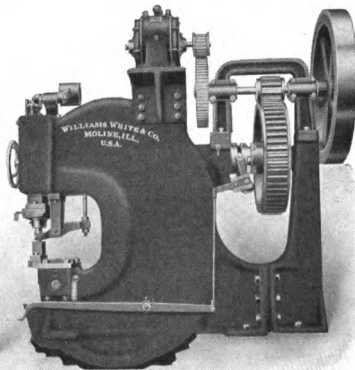
Regular standard "C" type double and single end Punches and Shears: a complete line of sizes with various depths of throats, types of jaws and equipment.

Catalog furnished on request containing details and specifications.

**Multiple Head Tapping Machines,**—For tapping pipe fittings, all sizes up to 8" and 10" fittings.

In addition to machines mentioned above our line includes the following:

Upsetting Forging and Rivet Machines  
Eye Benders  
Bending and Straightening Machines  
Horizontal Punches  
Hydraulic Presses



"C" Type Single End Punch and Shear

Stay Bolt Breakers  
Rotary Riveting Hammers  
Hydraulic Plate Benders  
Angle Bending Rolls  
Angle Shears

*Making as we do a complete line of Punching, Shearing, Forging and Bending Machines, Eye Benders, Forging Rolls, Power Hammers and Drop Hammers, we are often called upon in an engineering or advisory capacity to recommend and select the machines adapted to produce the required article or shape. Our long experience with all these machines, and consultations with our experts are at the disposal of those interested.*

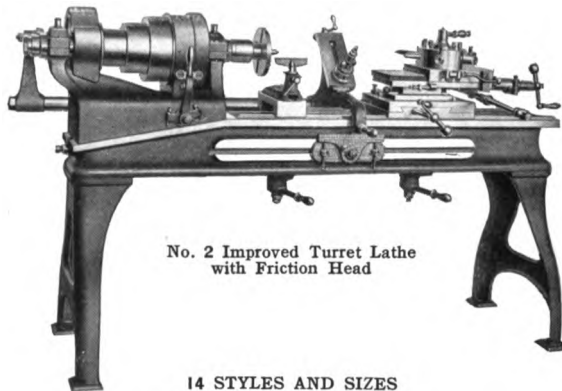
COALING STATIONS FOR COALING LOCOMOTIVES

# THE AMERICAN TOOL & MACHINE CO.

INCORPORATED 1864

BOSTON, MASSACHUSETTS, U. S. A.

POWER TRANSMISSION MACHINERY; "WESTON" CENTRIFUGALS  
AND HYDRO-EXTRACTORS; "ROPER" OIL SEPARATORS; LEATHER  
SPLITTING MACHINES; "FOX" TURRET LATHES; WASTE WASHING  
MACHINES; FABRIC COATING MACHINES; SPREADERS, DOUBLERS;  
RUBBER CEMENT CHURNS



No. 2 Improved Turret Lathe  
with Friction Head

## 14 STYLES AND SIZES

| Style                              | No.                         | Actual<br>Swing  | Length<br>of Bed | Spindle                               | Takes B't'w'n<br>Centers |
|------------------------------------|-----------------------------|------------------|------------------|---------------------------------------|--------------------------|
| Turret Lathes.....                 | 00                          | 26 $\frac{3}{8}$ | 8 ft.            | 2 $\frac{1}{8}$ " Hollow              | 46 in.                   |
|                                    | 0                           | 24               | 8 ft.            | Solid                                 | 46 in.                   |
|                                    | 1                           | 18               | 6 ft.            | Solid                                 | 33 in.                   |
| Cabinet Turret Lathes....          | 1                           | 20 $\frac{1}{2}$ | 7 ft.            | Solid and<br>1 $\frac{1}{2}$ " Hollow | 34 in.                   |
|                                    | 1                           | 20 $\frac{1}{2}$ | 7 ft.            | 3" Hollow                             | 34 in.                   |
|                                    | 1-With Fric-<br>tion Head } | 20 $\frac{1}{2}$ | 7 ft.            | Solid                                 | 34 in.                   |
|                                    |                             | 2                | 6 ft.            | Solid                                 | 27 in.                   |
|                                    |                             | 2                | 6 ft.            | 1 $\frac{1}{2}$ " Hollow              | 34 in.                   |
| Improved Turret Lathes...          | 2-With Fric-<br>tion Head } | 18 $\frac{1}{2}$ | 6 ft.            | 1 $\frac{1}{2}$ " Hollow              | 34 in.                   |
| Improved Lathe.....                |                             | 17               | 6 ft.            | 1 $\frac{1}{8}$ " Hollow              | 27 in.                   |
| Square Arbor Lathes.....           | 1                           | 15               | 5' 6"            | Solid                                 | 26 in.                   |
| Set Over and Back<br>Motion Lathes | 2                           | 13               | 5 ft.            | Solid                                 | 27 in.                   |
|                                    | 3                           | 12 $\frac{1}{4}$ | 5 ft.            | Solid                                 | 26 in.                   |



No. 2 Oil Separator

## "ROPER" OIL SEPARATORS

No. 1

Pan Capacity 520 cu. in.

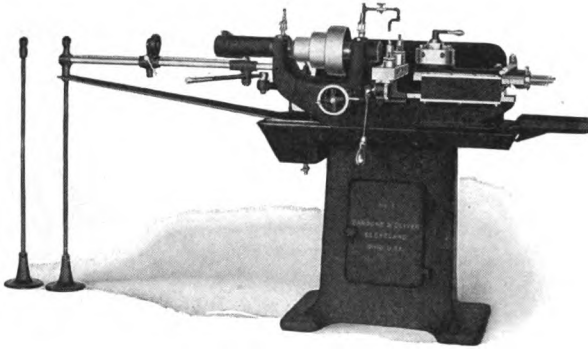
No. 2

Pan Capacity 2540 cu. in.

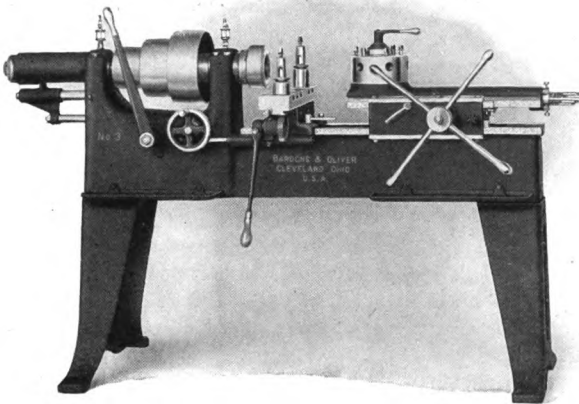
Also mounted and geared for electric  
drive at any voltage

**BARDONS & OLIVER**  
CLEVELAND, OHIO  
MANUFACTURERS OF TURRET MACHINERY

---



**No. 1— $\frac{1}{2}$ " Bar Stock Capacity Turret Lathe**  
**TURRET LATHES WITH OIL PAN AND OIL PUMP**  
For Bar, Forging and Casting Work  
Requiring the Use of a Lubricant  
Fourteen sizes— $\frac{3}{8}$ " to 6" capacity



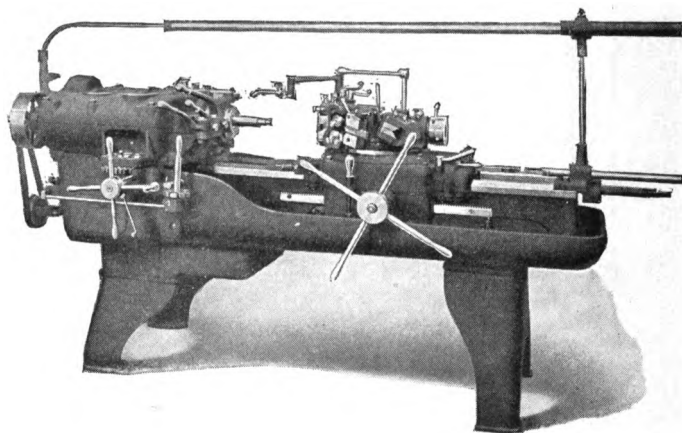
**No. 3—17" Swing Turret Lathe**  
**TURRET LATHES WITHOUT OIL PAN MOUNTED ON LEGS**  
For Brass and Other Metals Not  
Requiring the Use of a Lubricant  
Five sizes—13" to 22 $\frac{1}{2}$ " swing

*Machines furnished completely equipped with  
standard or special tools when desired.*

## JONES & LAMSON MACHINE CO.

SPRINGFIELD, VERMONT, U. S. A.

97 Queen Victoria St., LONDON, ENGLAND



### THE FLAT TURRET LATHE

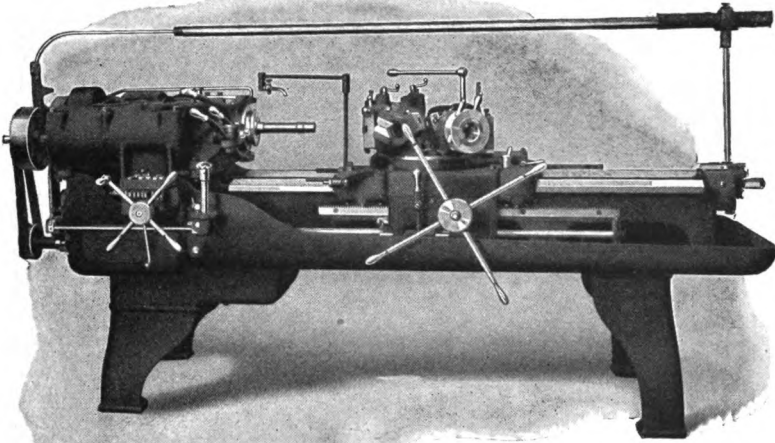
Until a few years ago, the turret lathe was looked upon as a special machine restricted to a certain class of work, but that day is past and now it is only the occasional shop that does not include a turret lathe in its equipment.

Manufacturers of today, doing business on a competitive basis, use the turret lathe in every possible instance, in their estimates—even on small quantity lots. The same principle is applied in the smaller machine shops. Small orders of duplicate parts, formerly done on the engine lathe are now handled on the turret lathe at a greatly reduced cost per unit.

We are the pioneers in the turret lathe field. Our early designs had the Cone Head, Back Gears and Cross Slide—all of which were practical and the best available at the time, but the improved Cross Feeding Head—used exclusively on the Jones & Lamson Turret Lathes—eliminated these slow and practically obsolete features. Instead of reaching over the machine for a Back Gear lever, shifting belts for various **speeds and feeds**, and numerous other time consuming antics peculiar to the old fashioned Cone Head and Back Gear type, the operator of a J. & L. obtains, instantly, **nine changes of feed** ranging from 20 to 120 per inch with but a slight move of a **single lever** directly in front of him, and **nine changes of speed** by a slight shift of **two levers** directly above the **feed change lever**—all within easy reach of the operator and changed instantly. These superior features are made possible by means of the unique **selective gear transmission** embodied in the head and the **selective gear mechanism** controlling the feed of both the Cross Feeding Head and Turret—all gears being partly submerged in oil, which adds to their life and makes a comparatively quiet running machine.

The machine shown on this page is our regular 2¼x24 Flat Turret Lathe. Its capacity on bar work ranges up to 2¼" diameter and 24" in length. Chuck work up to 12" swing. Our 3x36 is shown on the next page.

## JONES & LAMSON MACHINE CO.



### THE FLAT TURRET LATHE

The constructions of the 3x36 Flat Turret Lathe shown above is practically identical with the 2¼x24 on opposite page, except that it has a wider range on both bar and chuck work. Its capacity on bar work ranges up to 3" diameter and 36" in length, and accommodates chuck work up to 14" swing.

#### Superior Features of these Machines

**The Cross Feeding Head**—Permits of absolute rigidity and independent control of both the tools and work. The Cross Feeding Head eliminated the frail cross slide formerly placed between the turret and head, or on top of the turret. It has reduced the operator's movements, cost of production, and has greatly facilitated the handling of quantity production.

**Selective Gear Transmission of Turret and Head**—Nine feed changes of head or turret, either direction, ranging from 20 to 120 per inch—instantly obtained by a slight shift of a single lever directly in front of the operator. The combination of this feature and the selective gear mechanism for spindle speeds, eliminated the "old fashioned" Cone Head and Back Gear mechanism with its cumbersome, awkward and time consuming operations.

**Selective Gear Transmission for Spindle Speeds**—Nine speed changes of spindle instantly obtained with a slight move of two levers—for certain speeds only one lever is shifted—both directly over the feed change lever and all within easy reach of the operator without a single step.

**Positive Automatic Stops and Friction Feed**—The unique stop and friction feed mechanism is a highly efficient combination; the friction feed ensures an absolutely accurate shoulder on the work by keeping a predetermined tension on the tool when the feed is released, thereby, eliminating the rebound action—a common fault with other types of feed and stop mechanism. **This stop mechanism provides seven stops for any one position of the turret, or two stops for every position if all are used.** These stops may range from 1 to 7 on any desired position of the turret; five of them are obtained by means of the auxiliary stop mechanism. The above combination is an exceedingly desirable feature on a turret lathe and used exclusively on Jones & Lamson Turret Lathes.

**Simple Construction**—Too much stress cannot be placed on this feature, for the life of the machine, its parts, and positive and instantaneous action depends upon it, and that is what counts in machine efficiency. Simple mechanical principles, convenient arrangement of tools and accessibility of operating parts are the distinctive features which have, for more than half a century, placed the Jones & Lamson Flat Turret Lathes pre-eminent among machines of this type.

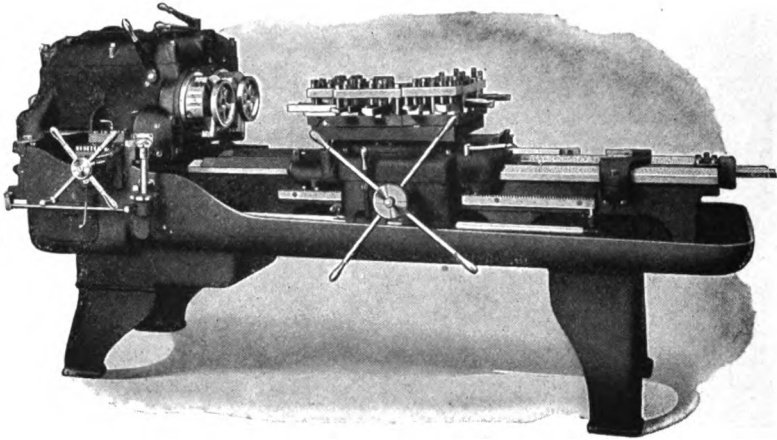
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## JONES & LAMSON MACHINE CO.

SPRINGFIELD, VERMONT, U. S. A.

97 Queen Victoria St., LONDON, ENGLAND



### THE DOUBLE SPINDLE FLAT TURRET LATHE

Capacity, using two spindles, 10" swing

Two illustrations of the most highly productive chucking machine within its range.

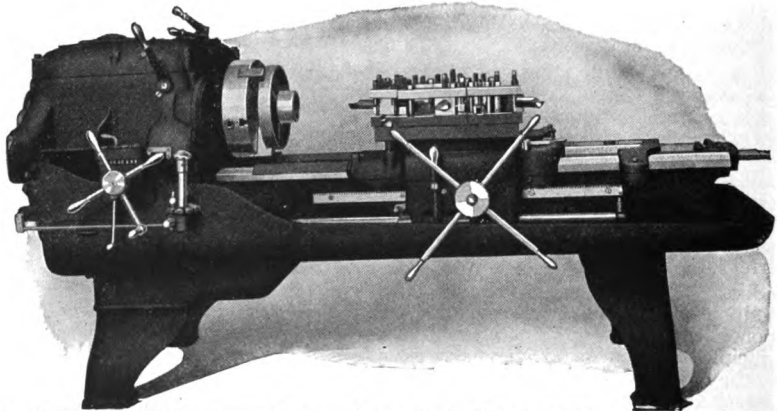
It has all the mechanical refinement of our two machines described on the preceding pages and is constructed on the same general lines, except that it is distinctly a chucking machine.

On chuck work up to 10" swing, where quantity, quality and cost per unit per machine are considered, this machine stands alone; it has absolutely no competitor within the above range.

It cuts the operating cost in half; cuts the time per piece in half, operates with equal precision to any single spindle machine, and occupies less than half the floor space required by Single Spindle Machines for an equivalent output. If you have the work the machine will pay for itself in a very short time.

Two Spindles, Two Sets of Tools, Two Pieces of Work Finished at a time, and only One Operator required.

It has the further advantage of handling chuck work up to 17" swing on a single spindle, shown below.

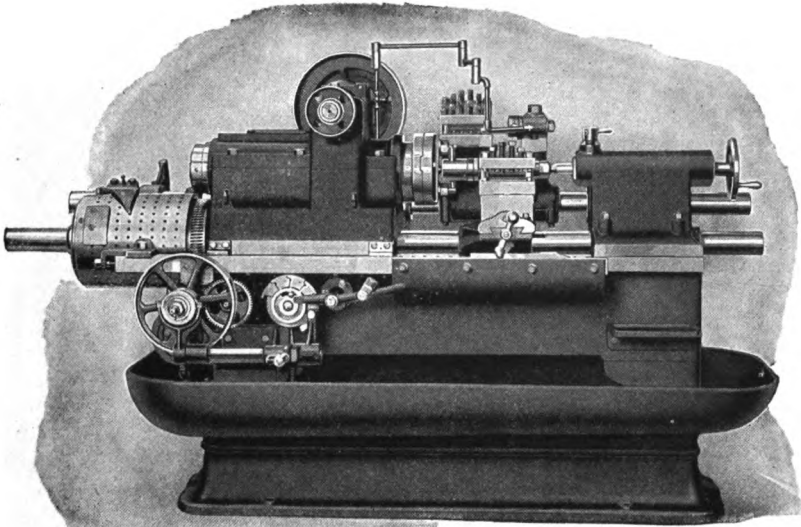


The Double Spindle Flat Turret Lathe used as a Single Spindle Machine. Capacity 17" Swing

# JONES & LAMSON MACHINE CO.

SPRINGFIELD, VERMONT, U. S. A.

97 Queen Victoria St., LONDON, ENGLAND



## THE FAY AUTOMATIC LATHE

Swing over Shears 14"—over Carriage 10". Will turn lengths up to 10".

Where intensive production is carried on there is usually a large volume of second operation work and the facilities for handling this class of work form the underlying principles of scientific management. Every well equipped plant handles this class of work either on a turret lathe or Fay Automatic Lathe. Much of the work that comes from your hand or automatic Turret Lathes requires further machining. The outside diameter has to be turned; the face that was next to the chuck must be finished, and perhaps various operations are necessary on the part that was held by the chuck.

There are many jobs turned on centers, which, if in sufficient quantities and staunch enough to withstand the strain of several operations at a time, can be machined on the FAY and the cost per unit reduced to a minimum. Bevel gear blanks, tapered pieces, steering knuckles for automobiles, small, crowned pulleys, etc., are profitably handled on the Fay.

It is not uncommon to find a FAY using 10 tools operating simultaneously on ten surfaces, roughing and finishing and often doing two pieces at a time by putting two pieces on a single arbor. The number of tools is limited only by the number of cuts the work will stand. The machine is so rigidly constructed it is practically impossible to overload it.

Think what 10 or 12 operations at a time represents, especially when compared with turning on the engine lathe where one tool at a time is cutting. Think of the saving on quantity lots and even then you will have but a vague idea of the possibilities of the FAY.

There is just one way to satisfactorily determine to what extent you will profit by installing a FAY and that is—get in touch with us, let us know your requirements and we will do the rest.

The Fay catalogue will be sent on request, or our representative will gladly give you interesting facts.

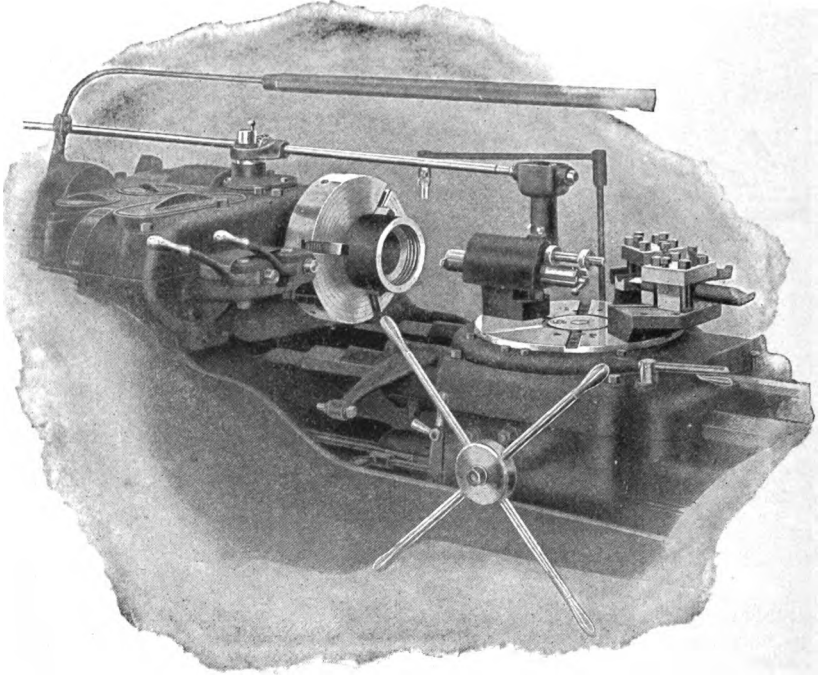
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## JONES & LAMSON MACHINE CO.

SPRINGFIELD, VERMONT, U. S. A.

97 Queen Victoria St., LONDON, ENGLAND



### THE HARTNESS CHASING ATTACHMENT

**Automatic Threading with a Hand Turret Lathe.** The above photograph shows the Hartness Chasing Attachment applied to a Jones & Lamson Flat Turret Lathe. Ten years ago we tried it as an experiment, but it proved such a time saver over the Engine Lathe method the idea was developed for commercial purposes, and today a large percentage of users of Jones & Lamson Turret Lathes consider it a most valuable adjunct to their outfit. It pays for itself in a short time.

The threading tool is under lead screw control, but it is automatically released at the end of the cut and returned, at high speed, to the starting point, thus, eliminating the slow return and minimizing the time between cuts.

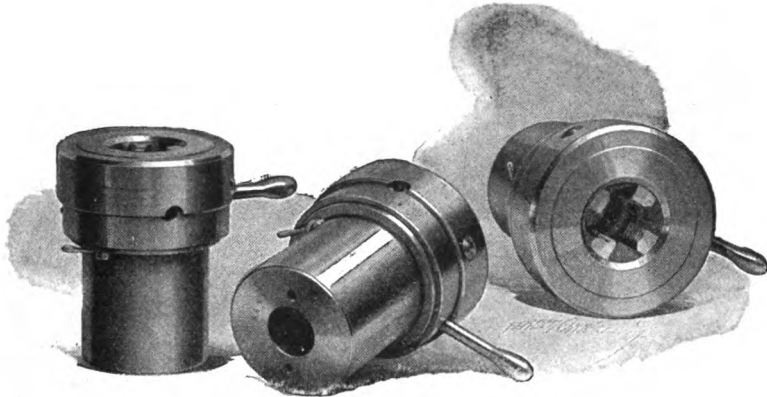
**Advantages:** The machine spindle revolves continuously; thread tool is automatically released at end of cut; no reversing of the machine spindle and the accompanying wear and tear due to the sudden change of motions; no danger of over-running or gouging regardless of speed—the machine takes care of that. Less time required per unit, time between cuts reduced to a minimum, perfect control and a degree of accuracy equal to any Engine Lathe. It adds to the life of your machine, checks the waste of time on your thread cutting and adds to the machine's efficiency.

The Hartness Chasing Attachment is listed in our Turret Lathe Catalog which will be sent to interested parties.



# JONES & LAMSON MACHINE CO.

|   |   |  |
|---|---|--|
| BOYER-CAMPBELL Co.<br>Detroit, Mich.        | American Agents for Dies and<br>Chasers:      | PACIFIC TOOL & SUPPLY Co.<br>San Francisco, Cal. |
| E. L. ESSLEY MACHINERY Co.<br>Chicago, Ill. | ROBINSON, CARY & SANDS Co.<br>St. Paul, Minn. | E. A. KINSEY Co.<br>Cincinnati, Ohio.            |
| CAREY MCHY. & SUPPLY Co.<br>Baltimore, Md.  | W. M. PATTISON SUPPLY Co.,<br>Cleveland, O.   |  |



## HARTNESS WIDE RANGE AUTOMATIC DIES

When purchasing precision tools, such as micrometer, caliper gauge, and various other tools, you naturally test them for accuracy in addition to the economical feature of being adaptable to the widest range consistent with a reasonable safety factor. Why not do the same with Automatic Dies?

Where the work demands absolute accuracy this care in selecting Dies is compulsory, but there are many cases, however, where a variation ranging from five to twenty-five thousandths on the lead or pitch diameter seems of little consequence, or, to put it properly, the threads will permit of distortion through misfit and shear force, and often pass as a good fit because of the force required to make the threads mesh.

Forcing threads to mesh invariably results in perpetual trouble, and frequently machine parts or tools exceeding the cost of a good Die are made practically worthless on this account.

With range of work considered, the Hartness Dies cost no more than others and considerably less than some. For precision work we can furnish Hartness Chasers with a .001 inch per inch limit. Note the wide range—with but three Die Heads, diameters ranging from  $\frac{1}{4}$ " to 3". Threads as fine as 32 per inch may be cut on the largest diameter. A fourth, No. 1 Die, covers a range from  $\frac{3}{32}$ " to  $\frac{9}{16}$ ".

**Three distinct economical advantages of the Hartness Wide Range Dies—Few Die Heads—Small Investment—Small Upkeep and Depreciation Costs.**

### Die Head Features

All parts perfectly interchangeable.

The Die opens automatically, preventing the possibility of stripping the thread on the return stroke.

The connection between the shank and the body of the die is a double universal joint, facilitating perfect flexibility under the greatest torsional strain.

The cam latch pin is provided with two surfaces, one for roughing and one for finishing. A half turn changes it from one to the other, without altering adjustments.

The chaser cam bears directly over and very close to the cutting strain, equalizing the strain on the chasers and adding considerable to the life of Die Heads and Chasers—a feature which facilitates accurate thread cutting.

### Chaser Features

No special grinder required with its additional cost and upkeep. Grinding fixtures furnished with Dies and the grinder used for general purposes will suffice.

Nothing to get out of order. Simple adjustments.

Greater life under high cutting speeds.

Chasers that are really interchangeable.

Chasers for right or left hand threads.

Hartness Chasers are milled—not hobbled—insuring perfectly formed threads.

And last, but not least, chasers that will cut a thread truer in lead and truer to size than any chaser on the market.

The Hartness Dies are made for use on any Screw Machine or Turret Lathe. In your order give the name of machine and size of shank. Die Catalog furnished on request.

## REED-PRENTICE COMPANY

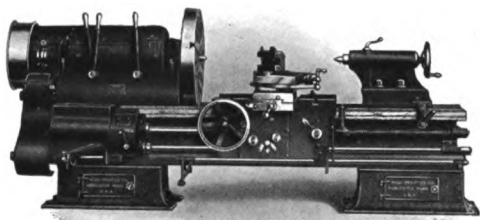
WORCESTER, MASS.

F. E. REED CO. DEPARTMENT  
Established 1875

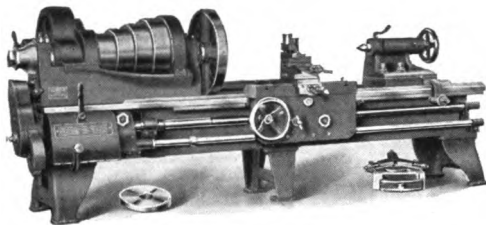
PRENTICE BROS. CO. DEPARTMENT  
Established 1872.

**BUILDERS OF LATHES AND DRILLING MACHINES**

### LATHES



**Prentice 27" High Speed Geared Head Lathe**



**Reed 24" Heavy Duty Lathe**

**Geared Head High Speed Lathes:** The "Prentice" High Speed Geared Head Lathe has an all-friction clutch head stock, making it the most rapid speed changing lathe built. Built in 12", 14", 16", 18", 20", 27" sizes.

The "Prentice" High Speed Turret Lathe is a powerful and rigid machine designed for the rapid production of duplicate parts. Built in 16" and 18" sizes.

**Heavy Duty Double Back Geared:** The "Reed" Heavy Duty Lathe is designed and built to withstand the strain of constant heavy turning, and is especially adapted for Railroad and all kinds of Heavy Duty. Made in 16", 18", 20", 22" and 24" sizes.

**Plain Turning—Double Back Geared:** The "Prentice" Three Step Cone, Double Back

Geared Lathe is a rigid and powerful type of machine, designed to meet the demand for a modern engine lathe having sufficient power to use high speed steel cutting tools economically. Made in 14", 16", 18", 20", 27" sizes.

**Standard Single Back Geared:** The "Prentice" Engine Lathe is an accurate, reliable machine, embodying high-grade workmanship throughout. Made in 9", 12", 14", 16", 18" sizes. The 9" size is a screw cutting lathe of exceptional value for small work.

The "Reed" Standard Engine Lathe is especially adapted for a wide range of work, both light and heavy. Made in 10", 12", 14", 16", 18", 20", 22", 24" sizes. The 10" lathe is well adapted for experimental and also light work.

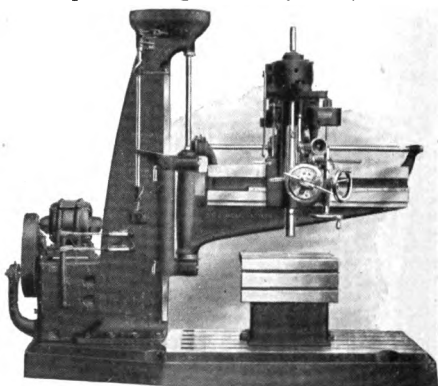
### DRILLS

**Radial, Plain and Ball Bearing—Gear Speed Change Vertical, Plain, and Ball Bearing Standard Pattern Vertical—Small Upright Sensitive Plain and Ball Bearing.**

**Ball Bearing Sensitive Drilling Machines:** Built with one, two, three, four, five and six spindles. Amply "rigid" in construction to stand high spindle speeds without vibration.

**Upright Drilling Machines:** Built in 20", 21", 23", 24", 26", 28", 30", 36" sizes.

**Ball Bearing Radial Drilling Machines:** Centralized control of all levers reduces lost time to a minimum. Standard pattern made in 3', 4', 5', 6' Arm size. Heavy pattern made in 3', 4', 5' Arm size.



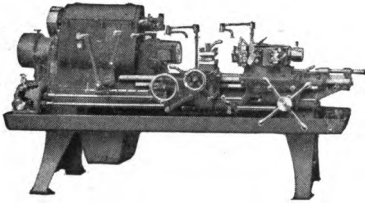
**Prentice 4 Ft. Arm Heavy Pattern Radial Drilling Machine**

# THE WARNER & SWASEY COMPANY

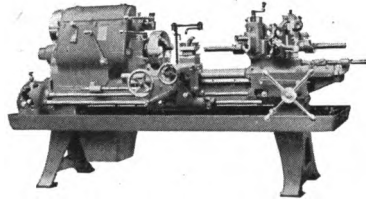
*Works and Main Office :* CLEVELAND, OHIO .

*Branch Offices :* NEW YORK, BUFFALO, BOSTON, DETROIT AND CHICAGO

## TURRET LATHES      TURRET SCREW MACHINES BRASS-WORKING MACHINE TOOLS



No. 2A—Tools for Bar Work

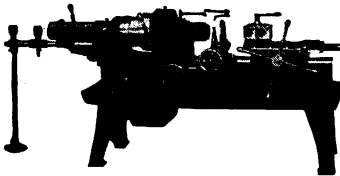


No. 2A—Tools for Chucking Work

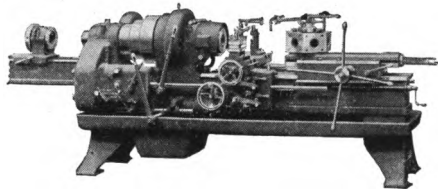
### UNIVERSAL HOLLOW-HEXAGON TURRET LATHES

For the rapid, accurate and economical production of lathe work; from bar stock, forgings and castings. Complete tool equipments for bar and chucking work.

Two sizes: Automatic Chuck capacity,  $2\frac{1}{4}$  and  $3\frac{1}{4}$ "; length turned, 26 and 36"; chuck swings, 12 and 15".



No. 6—Bar Capacity  $2\frac{1}{4}$ "; Swing, 18"



No. 8—Bar Capacity  $3\frac{1}{4}$ "; Swing, 20"

### TURRET SCREW MACHINES

Five sizes— $\frac{5}{8}$  to  $3\frac{5}{8}$  automatic clutch capacity; 10 to 20" swing.

With or without automatic chuck; bar feed; automatic feed for turret; automatic feed for cut-off, etc.—every modern facility for rapid production.

### TURRET LATHES AND BRASS-WORKING MACHINE TOOLS

Turret Lathes—12 to 24" swing; Plain, Set-over or Universal turret; with or without Geared-friction Head, Automatic Chuck; Cut-off; Forming attachment; Chasing attachment, etc.

Automatic Boring and Tapping Machines; Valve Milling Machines; Key Lathes; Cock Grinders, etc.—for the manufacture of valves, cocks, fittings and similar work.

Equipments planned and estimates of outputs furnished upon request.

## **WINDSOR MACHINE COMPANY**

**WINDSOR, VERMONT, U. S. A.**

FOREIGN OFFICE: 68 Ave. de la Grande Armée, PARIS, FRANCE.

**GRIDLEY AUTOMATICS: SINGLE SPINDLE, MULTIPLE SPINDLE:  
MULTIPLE SPINDLE DRILL: PISTON AND RING MACHINE.**

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On the opposite page is a group of illustrations of GRIDLEY AUTOMATICS for turning, drilling, reaming or forming pieces more economically than in any other manner.

### **GRIDLEY SINGLE SPINDLE AND THE GRIDLEY MULTIPLE SPINDLE AUTOMATICS**

are designed for making parts from bars up to five inches in diameter. The tools used are held stiffly, close to their cutting point, and the simplicity of the set-up allows a wider range of tooling to be used.

GRIDLEY MULTIPLE SPINDLE AUTOMATICS have four spindles, a single belt constant speed drive and a quick-change-gear feed box. They are made in four sizes with a maximum capacity for bars of  $\frac{3}{4}$ ",  $1\frac{1}{4}$ ",  $1\frac{3}{4}$ " and  $2\frac{1}{4}$ " respectively, the  $\frac{3}{4}$ " machine finishing work up to and including  $5\frac{1}{2}$ " and the  $2\frac{1}{4}$ " up to and including 7".

THE SINGLE SPINDLE AUTOMATICS are built in six sizes, viz.,  $1\frac{1}{4}$ ",  $1\frac{3}{4}$ ",  $2\frac{1}{4}$ ",  $3\frac{1}{4}$ ",  $4\frac{1}{4}$ " and 5" with a capacity for handling bars not larger in diameter than their respective sizes imply and turning up to 12" in length.

### **GRIDLEY PISTON AND RING MACHINE**

is a Semi-Automatic for making piston rings and pistons to advantage.

The largest rings this machine will handle are 6 inches in diameter. Smaller rings, down to those used in motorcycle engines, can be made as the proper spindle speed can be secured.

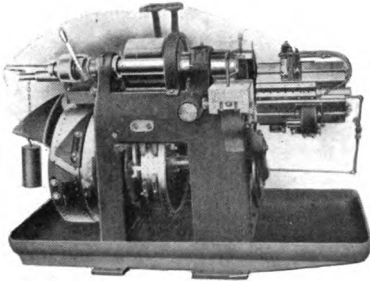
### **GRIDLEY AUTOMATIC MULTIPLE SPINDLE DRILL**

is an automatic machine for rapidly drilling, reaming, facing and counterboring parts. The time for producing a finished piece, whether it has one hole or ten and whether each hole has to be reamed or counterbored or not, is that taken to complete the longest operation. It differs radically from other Drilling Machines as the spindles are adjustable both radially and circumferentially, enabling the locating of all tools at a common center or at different points. All spindles are individually adjustable, so that they may be placed in position to act upon any point or to any depth, regardless of the position of the other tools.

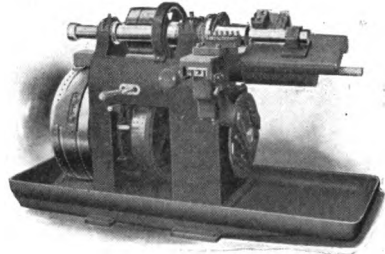
## WINDSOR MACHINE COMPANY

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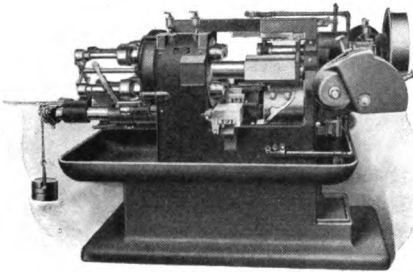
### GRIDLEY AUTOMATICS



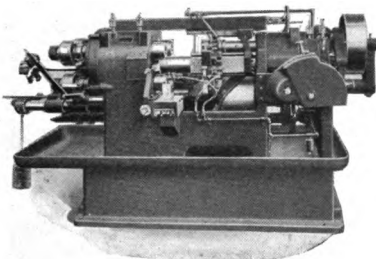
**Gridley Single Spindle Automatic**



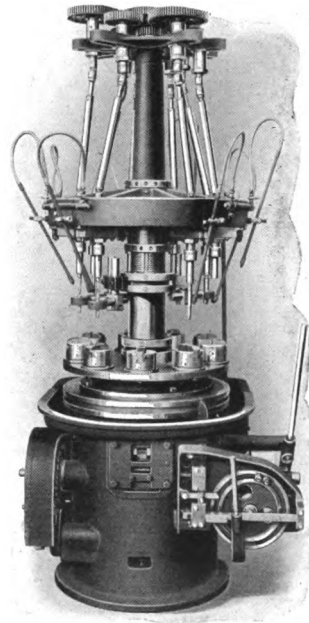
**Gridley Piston and Ring Machine**



**Gridley Multiple Spindle Automatic**  
 $\frac{3}{4}$ " and  $1\frac{1}{4}$ "



**Gridley Multiple Spindle Automatic**  
 $1\frac{3}{4}$ " and  $2\frac{1}{4}$ "



**Gridley Automatic Multiple Spindle  
Drill**

# THE DETRICK & HARVEY MACHINE CO.

BALTIMORE, MD.

**MANUFACTURERS OF THE OPEN SIDE PLANERS; HORIZONTAL BORING, DRILLING AND MILLING MACHINES; SPECIAL MACHINERY.**

## THE OPEN SIDE PLANER

This term, used by this Company and its predecessors, Detrick & Harvey, for the past 25 years, actually describes the novel and patented construction in contradistinction from metal planers of the ordinary two-post type. These planers are offered as equal to the ordinary type in the performance of the regular line of work, and in capacity and adaptability as excelling any other metal planing tool.

The *Open Side Planer* takes work under the beam slightly larger than the rated vertical dimension, and squares down the outside of work to the rated width. It actually planes, by angling the beam head, several inches wider on a straight surface.

**Sizes and Capacity**

| Size    | Will Plane Wide, Ins. | Will Plane High, Ins. | Length, Feet       |
|---------|-----------------------|-----------------------|--------------------|
| 30 Inch | 40                    | 31                    | 6, 8, 10, 12, 14   |
| 36 Inch | 50                    | 37                    | 8, 10, 12, 14, 16  |
| 42 Inch | 58                    | 43                    | 10, 12, 14, 16, 18 |
| 48 Inch | 62                    | 49                    | 12, 14, 16, 18, 20 |
| 60 Inch | 75                    | 61                    | 14, 16, 18, 20, 22 |
| 72 Inch | 91                    | 73                    | 16, 18, 20, 22, 24 |

## THE CONVERTIBLE OPEN SIDE PLANER

is designed to cover a wide range of planing work and is the equal of a double housing planer of the same rated capacity, embodying the use of four tools. Through the removal of the outer housing or post, the machine is converted into an Open Side Planer, and the wide range and great adaptability peculiar thereto is obtained. The Convertible Open Side Machines are built in sizes 42 inches to 96 inches square, by any length.

## THE OPEN SIDE EXTENSION PLANER

This type differs from the standard Open Side Planer in that it has an outside post and long beam. This outside post is adjustable in an extension bed to and from the Planer platen. It will be especially noted that both side heads can be used simultaneously in a wide range of work, varying in size from the width of the table to the full rated width of the Planer, while the long beam gives a corresponding range of travel to the horizontal heads.

These machines are made in the following sizes:

To plane 84 inches by 60 inches high by 12, 14, 16, 18 or 20 feet if desired.

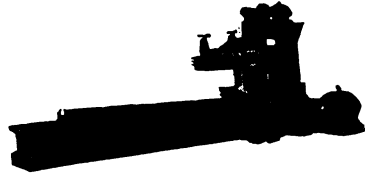
To plane 96 inches wide by 72 inches high by 14, 16, 18, 20 or 22 feet, or longer, if desired.

To plane 120 inches wide by 96 inches high by 16, 18, 20, 22 or 24 feet, or longer, if desired.

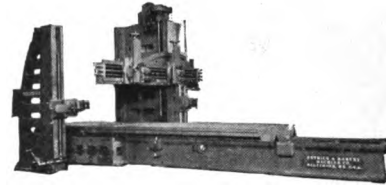
To plane 120 inches wide by 120 inches high by 24 feet, or longer, if desired.

## HORIZONTAL DRILLING, BORING AND MILLING MACHINES

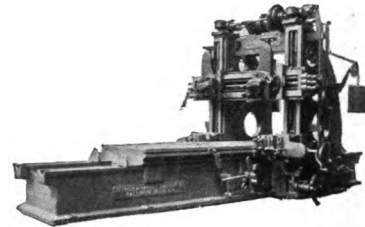
These machines are commonly known as Floor Boring Machines and consist principally of a Column mounted on a Runway, a Spindle-Saddle mounted on the Column and a Work Bed. Can be equipped with Outer Support, Universal Table, Plain Table, Scales and Pump.



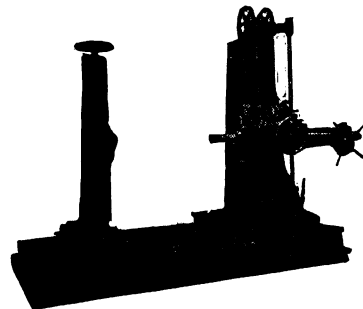
**Motor Driven Open Side Planer**



**Convertible Open Side Planer, Showing Outer Housing Removed Converting the Machine into an Open Side Planer**



**Standard Double Housing Planer**



**Horizontal Drilling, Boring and Milling Machine**

# T. C. DILL MACHINE COMPANY, INC.

PHILADELPHIA, PA., U. S. A.

## BUILDERS OF SLOTTERS

### THE "DILL SLOTTER"

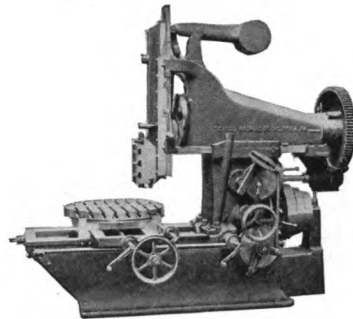
In the design of the "Dill Slotter," to meet the demands of today, it was plain that a departure was necessary and that procedure must be in at least two directions. First: that the machine must be able to produce a greater amount of work and that work must be more accurate. Second: that it must have a much greater range and not be confined only to the ordinary slotter work, but also reach out into other fields of usefulness; and, besides all this, it must be, if possible, more durable. The following features, which for the most part are exclusive, show how this Slotter meets the above requirements.

The GENERAL CONSTRUCTION of the "Dill Slotter" throughout is such as to insure efficiency and durability. It is constructed of the best material for the purpose; the gears are all cut from solid metal and mostly of forged steel; flat bearing surfaces are all hand-scraped to surface plates and are of ample dimensions. Gears, shafts, etc., are readily accessible for inspection. The convenience of operation is of special merit; while it is operative from one point principally, hand feeds are provided on all sides.

#### Attributes

15 Inch Slotter. Belt or Motor Driven

- A Traveling Head—Greatly increases the range of the machine.
- A Quick Traverse Gear—A great time and labor saver.
- New Quick Return—Permits high and uniform cutting speeds.
- New Intermittent Feed—For feeding heavy work at high speeds.
- An Automatic Knock-Off—A safety device for the feed mechanism.
- A Stroke Indicator—Quite indispensable; nothing like it.
- A Hand Wheel Controller—A good thing, and in the right place.
- A Tool Post in the Relief Apron—Very handy in changing tools.
- Six Changes of Speed—About four is the usual number.
- Belt and Motor Driven—Designed for both; not a make-shift.
- Powerfully Geared—About double the usual ratio.



Arranged for Belt Drive

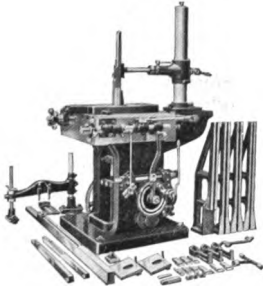
#### PRINCIPAL DIMENSIONS

|  |              |              |              |              |              |              |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Size of machine, ins. ....                         | 10           | 10-12        | 15           | 15-18        | 20           | 20-24        |
| Maximum stroke, ins. ....                          | 10½          | 12½          | 15½          | 18½          | 21           | 25           |
| Longitudinal movement of table, in. ....           | 28           | 28           | 36           | 36           | 48           | 48           |
| Transverse movement of table, in. ....             | 20           | 20           | 30           | 30           | 40           | 40           |
| Diameter of table, in. ....                        | 24           | 24           | 34           | 34           | 44           | 44           |
| Movement of head, in. ....                         | 15           | 15           | 21           | 20           | 30           | 30           |
| From table to head, in. ....                       | 12           | 12           | 19½          | 19½          | 24½          | 24½          |
| Adjustment of ram, in. ....                        | 16           | 16           | 23           | 23           | 32           | 32           |
| Will cut to the center of circle of. ....          | 54 in.       | 54 in.       | 72 in.       | 72 in.       | 92 in.       | 92 in.       |
| Will cut to outside of circle of. ....             | 54 in.       | 54 in.       | 90 in.       | 90 in.       | 108 in.      | 108 in.      |
| Strokes of ram per minute, r.p.m. ....             | 11½-85       | 10-76        | 8-48         | 7-43         | 6-31         | 5½ to 27     |
| Feed of table per stroke, in. ....                 | 0.011        | 0.011        | 0.010        | 0.010        | 0.0069       | 0.0069       |
|  | to 0.154     | to 0.154     | to 0.187     | to 0.187     | to 0.138     | to 0.138     |
| Circular feed per stroke at 12 in. dia. (in.) .... | 0.0187       | 0.0187       | 0.011        | 0.011        | 0.0065       | 0.0055       |
|  | to 0.261     | to 0.261     | to 0.196     | to 0.196     | to 0.11      | to 0.11      |
| Feed of head per stroke, in. ....                  | 0.0055       | 0.0055       | 0.005        | 0.005        | 0.00345      | 0.0345       |
|  | to 0.077     | to 0.077     | to 0.093     | to 0.093     | to 0.069     | to 0.069     |
| Ratio of gears from cone pulley shaft. ....        | 12 to 1      | 12 to 1      | 18 to 1      | 18 to 1      | 24 to 1      | 24 to 1      |
| Size of countershaft pulleys, in. ....             | 14 x 3½      | 14 x 3½      | 20 x 4       | 20 x 4       | 26 x 5       | 26 x 5       |
| Speed of countershaft, r.p.m. ....                 | 200          | 180          | 200          | 180          | 200          | 180          |
| Horsepower of motor. ....                          | 3            | 3            | 5            | 5            | 10           | 10           |
| Speed of constant speed motor, r.p.m. ....         | 1,200        | 1,000        | 1,200        | 1,000        | 1,200        | 1,000        |
| Speed of variable speed motor, r.p.m. ....         | 400 to 1,200 | 400 to 1,200 | 400 to 1,200 | 400 to 1,200 | 400 to 1,200 | 400 to 1,200 |
| Net weight, lbs. ....                              | 5,000        | 5,250        | 10,000       | 10,500       | 23,000       | 24,000       |

## MORTON MANUFACTURING CO.

WORKS: MUSKEGON HEIGHTS, MICH.

**BUILDERS OF DRAW CUT MACHINE TOOLS: KEYSEATERS, DRAW-CUT SHAPERS AND PORTABLE TOOLS. MACHINE KEYS.**



Stationary Keyseater

### MORTON STATIONARY KEYWAY CUTTERS

Efficient, Accurate, Low Cost of Up-keep.  
Durable and Best.

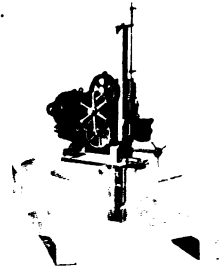
Built in the following sizes:

18", 24", 30" and 48" stroke.

Ask for *BULLETIN No. 1E.*

### PORTABLE KEYSEATERS

36", 48" and 60" Stroke.

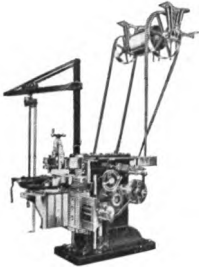


Portable Keyseater

### PORTABLE PLANERS

36" Stroke, 8 ft. bed.  
48" " 12 ft. bed.  
60" " 16 ft. bed.

Ask for *Illustrated BULLETIN No. 2E.*



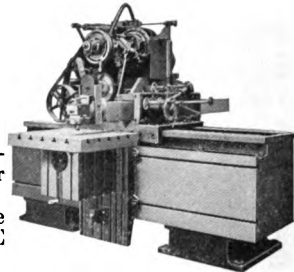
30" Shaper

### DRAW-CUT PILLAR SHAPERS

26", 30", 36", and 48" Stroke.

Powerful, Efficient and Accurate.  
Clear vision of LINES in Operating.  
It draws the WORK toward the COLUMN.  
Many other good points.

Ask for *BULLETIN No. 3E.*



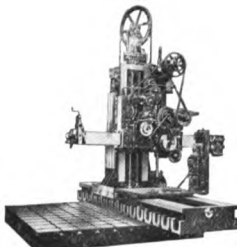
Anvil Block Shaper

### A PORTABLE ANVIL BLOCK SHAPER

By removing upper Section of the Bed, and moving to the ANVIL BLOCK of either STEAM or other POWER HAMMERS.

A TRAVELING HEAD SHAPER for large DIES and other work when set in the MACHINE SHOP.

*Information upon request.*



Traveling Head Planers

### TRAVELING HEAD DRAW-CUT PLANERS

Arranged for BORING and MILLING.  
Used either as Portable or Stationary.

#### Standard Sizes

|                           |       |       |        |        |
|---------------------------|-------|-------|--------|--------|
| Stroke . . . . .          | 4 ft. | 5 ft. | 6 ft.  | 7 ft.  |
| Vertical Feed . . . . .   | 4 ft. | 5 ft. | 8 ft.  | 10 ft. |
| Horizontal Feed . . . . . | 9 ft. | 9 ft. | 12 ft. | 12 ft. |

Ask for *BULLETIN No. 8E.*



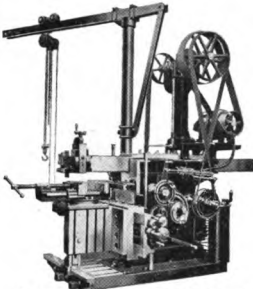
## MORTON MANUFACTURING CO.

### 32" SPECIAL RAILROAD DRAW-CUT SHAPER

Equipped for Slotting Axle Boxes up to the largest, PLANES BRONZE SHELL BEARINGS, ROD STRAPS, SHOES AND WEDGES, and a large variety of WORK.

Built in one size, 32" Stroke.

Ask for *BULLETIN* No. 6E.



Frog and Crossing Shaper

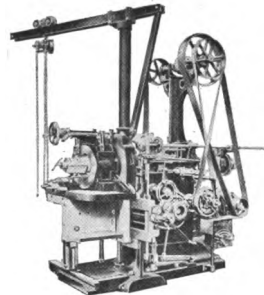
### SPECIAL DRAW-CUT FROG AND CROSSING SHAPER

48" stroke

Large ROUND END VISE, and especially equipped for FROG AND CROSSING WORK.

In use by all MANUFACTURERS of TRACK work and many prominent RAILROADS.

Ask for *BULLETIN* No. 10E.



Railroad Shapers

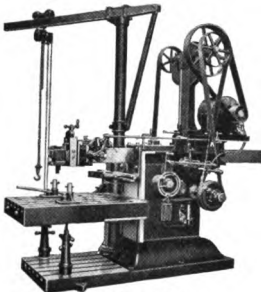
### LOCOMOTIVE CYLINDER PLANER

Built in two sizes, 48" and 60" Stroke.

Fully equipped with Chucks and Appliances for a full line of LOCOMOTIVE CYLINDERS.

It Bores the PISTON VALVE CHAMBER and MILLS THE PORTS on D Valve Cylinders.

Ask for *BULLETIN* No. 7E.



Steel Foundry Shapers  
Roll Wobble Shapers

### STEEL FOUNDRY SHAPERS

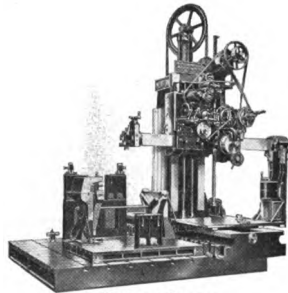
Both Stationary and Traveling Head

Especially adapted for cutting heads of LOCOMOTIVE FRAMES and general work. Large enough to remove the stock from longest Frame.

### SPECIAL ROLL WABBLE SHAPER

Will quickly centre and line the largest ROLL. POWERFUL and Easy to Operate as Roll does not move. The rapid machine for this work.

Ask for *BULLETIN* No. 9E.



Cylinder Planers

### FINISHED MACHINE KEYS

All sizes up to 2" by 20", Gibb Headed or Plain.

Also SPECIAL KEYS Guaranteed accurate and true.

We invite your Correspondence.

KEY DEPARTMENT, MORTON MFG. COMPANY, MUSKEGON, MICH.

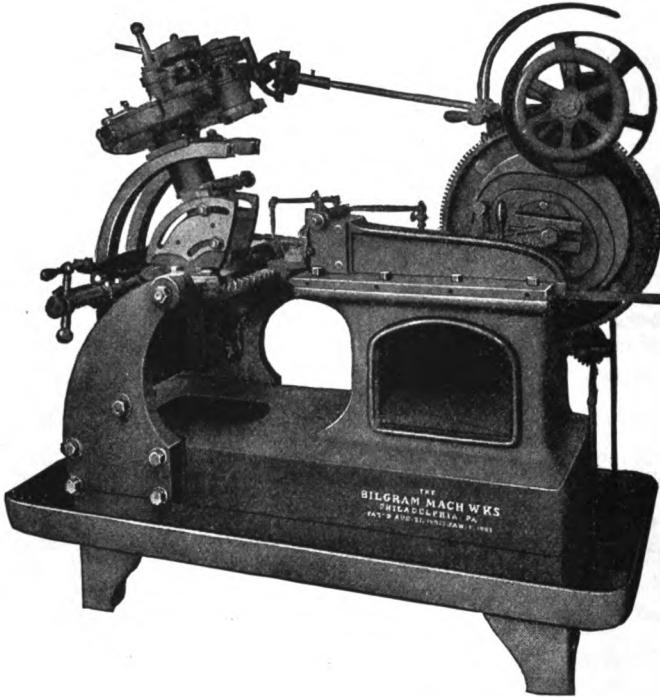


Finished Machine Keys

## THE BILGRAM MACHINE WORKS

1217 SPRING GARDEN ST. PHILADELPHIA, PA.

**MAKERS OF SPECIAL MACHINERY. NORMAL AND HELICOIDAL BEVEL GEARS CUT THEORETICALLY CORRECT. SPECIAL FACILITIES FOR CUTTING SPUR, WORM, SPIRAL AND INTERNAL GEAR WHEELS.**



### THE BILGRAM BEVEL GEAR GENERATOR SIX INCH TYPE

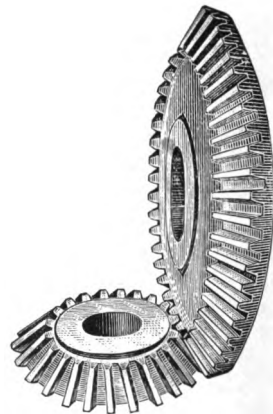
Planes bevel wheels up to 6 in. diameter, 1 in. pitch,  $2\frac{1}{2}$  face, from miter wheels to bevel wheels of proportion one to six.

Floor Space.....3 ft. 10 in. x 2 ft. 3 in.  
Net weight of machine.....1600 lbs.  
Net weight of countershaft, cone sectors,  
etc.....400 lbs.  
Gross weight.....2700 lbs.

### SIXTEEN INCH TYPE

Planes bevel wheels up to 16 in. diameter, 2 in. pitch, 6 in. face from miter wheels to bevel wheels of proportion one to four.

Floor space.....6 ft. 1 in. x 2 ft. 8 in.  
Net weight of machine.....3850 lbs.  
Net weight of machine, countershaft, cone  
sectors, etc.....850 lbs.  
Gross weight.....6100 lbs.



# THE FELLOWS GEAR SHAPER CO.

SPRINGFIELD, VERMONT, U. S. A.

**MANUFACTURERS OF THE FELLOWS GEAR SHAPER AND GEAR SHAPER CUTTERS**

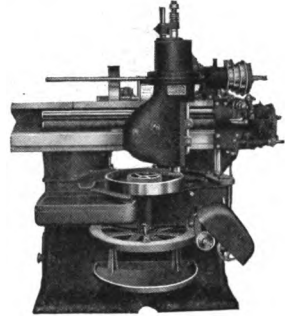
## THE FELLOWS GEAR SHAPER

The Gear Shaper is a gear generator, developing the gear tooth by a planing process. The cutter used is an original gear which is ground after it is hardened.

### CAPACITY

The No. 3 Gear Shaper cuts external spur gears of 24 inches diameter, 4 inches face, 6 diametrical pitch in cast iron, 7 pitch in steel. The No. 6 machine cuts external spur gears of 35 inches diameter, 5 inches face, 4 diametrical pitch, and internal spur gears of 28 inches pitch diameter, 3 inches face, 4 diametrical pitch. The No. 35 machine cuts helical gears of 18 inches diameter, 4 inches face, 6 pitch in cast iron, 8 pitch in steel.

*Some reasons why the Gear Shaper is accurate, convenient and fast.*



**No. 6 Gear Shaper  
Planing Internal Gear**

### Accuracy

1. Every cutter an original cutter.
2. Tooth curves mechanically generated, not copied—errors of hand and eye eliminated.
3. Tooth curves ground to shape after hardening—no distortion even in high speed cutters.
4. Teeth generated exactly right with a single cutter, for every number of teeth from 12 to the rack—no approximate shapes.
5. Continuous indexing mechanism—no sudden stops and starts.
6. Indexing mechanism free from irregularities of cutter drive.
7. No centering of cutter—no poor work from improperly set cutter.

### Convenience

1. Mechanism all on the outside—easy to inspect and adjust.
2. Work placed and removed without interference with any part of the machine
3. One cutter per pitch—no change of cutter for a change in number of teeth—small and inexpensive stock of cutters required.
4. Graduated stroke adjustment makes allowance for slight over-travel required.
5. Depth feed dial reads directly for pitch required.
6. Double cut feed gives roughing and finishing cuts without resetting or readjustment.
7. Automatic stop and alarm calls operator at conclusion of cut.
8. Cluster and shoulder gears cut with same ease as ordinary spur gears.
9. The Gear Shaper furnishes the only commercial process for cutting internal gears. They are cut with the same facility and accuracy as external spur gears, using the same cutter; no attachments required.

### Output

1. Maximum thickness of chip throughout the stroke.
2. Cutting stresses taken in direct tension and compression—rigid structural design holds tool to work without deflection or chatter.
3. Reverse taper work arbor binds work, arbor and spindle into one solid whole.
4. No excess travel required for burying the cutter in to depth.
5. Fine finish with heavy feeds permitted by nature of chip.
6. Free flow of lubricant on cutting edge, due to position of tool and work—permits high output.

## LANDIS TOOL COMPANY

WAYNESBORO, PA.

### PRECISION CYLINDRICAL GRINDING MACHINES

---

Our regular line consists of the following types:

**UNIVERSAL MACHINES** No. 1; No. 1½; No. 2; No. 3; No. 4. Nos. 2, 3 and 4 are also built with 16"-swing, and are used for finishing tools and a variety of straight or taper parts, both external and internal, such as are common to the toolroom, machine shop, railroad shops, etc.

Attachments, such as magnetic chuck, gear-cutter attachment, side mill grinding attachment, etc., can be used on these machines to advantage.

**PLAIN GRINDING MACHINES.** These strictly manufacturing machines are intended for finishing straight and taper spindles, shafts, rolls, tubing and all other work within their range which can be revolved on dead centers.

**PLAIN GRINDING MACHINES WITH GAP** are our 16" and 20" swing. Plain Machines, built with gap in the bed to suit the location of the projection on the work. Especially valuable for grinding locomotive piston rods.

**INTERNAL GRINDING MACHINE** for straight and taper internal grinding, and the fixtures for these machines will grind holes ¼" diameter, or larger, and up to 12" long.

**CRANK GRINDING MACHINE** for grinding single or multiple throw crank shafts used in gas and small steam engines.

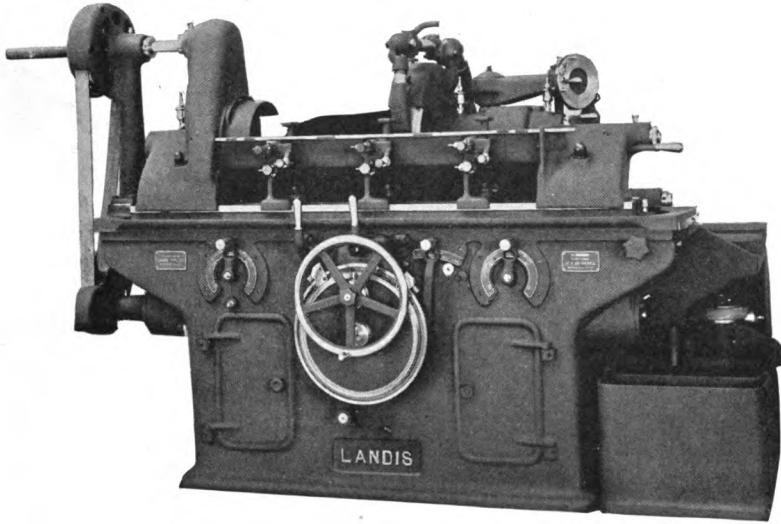
**ROLL GRINDING MACHINES** for grinding chilled iron and hardened steel rolls.

**CAM GRINDING ATTACHMENTS** for grinding cams are for use on our plain and universal grinders and are made for grinding either detachable or integral cams.

Our illustrated and descriptive catalogue and literature gives detailed information. It also describes the features which stand for quick manipulation, accurately finished work, durability of alignments and rapid production—all of which are prominent in the various types of Landis Grinding Machines.

## LANDIS TOOL COMPANY

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### **LANDIS IMPROVED SELF-CONTAINED GRINDING MACHINE**

Central control—increases efficiency of the operator.

Variety—independent work and traverse speeds suitable for rapid removal of stock or vice versa for finish.

Hand or automatic feed of wheel to work.

Sizing device which automatically stops feeding of wheel to work, permitting operator to prepare work during grinding operation.

Work rests with independent horizontal and vertical adjustments having stops which can be quickly set for grinding duplicate work.

Positive quick-setting traverse reversing dogs, requiring no wrenches or screw drivers.

Tarry device—adjustable to suit the respective work and traverse speeds.

Ample water circulation. Interchangeable wheel centers.

Massive construction insures rigidity and durability.

Chilled surfaces secures permanency of alignments.

Special-treated accurately ground wheel spindle uniformly lubricated, by sight oilers, through helical grooves.

Large bronze bearings with taper adjustments for wear and so designed to self-compensate for any heat expansion.

Work table firmly clamped to main body of machine and always entirely free from any overhang.

All gearing fully enclosed.

The grinding wheel carriage—a fixed weight—is the moving member.

Send for illustrated literature.

## LANDIS MACHINE CO., INC.

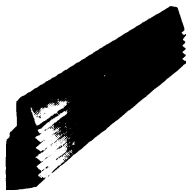
WAYNESBORO, PA., U. S. A.

**MANUFACTURERS OF BOLT THREADING, PIPE & NIPPLE THREADING, BOLT POINTING AND NUT TAPPING MACHINERY; SCREW CUTTING DIE HEADS; SPECIAL THREADING MACHINES; CHASER GRINDERS.**

### LANDIS PATENTED DIE HEADS

*The fundamental principles, to which the superiority of the Landis Die is attributed, depart widely from those of other designs. As a result, longer life, increased production and greater accuracy are claimed in comparison with other threading tools.*

**Landis Chasers** are milled from flat bar steel, and are *hard their entire length. It is unnecessary to anneal, hob or retemper the die they form. The grinding of the chasers at the front end gives the Landis die a distinctive characteristic which insures uniform and permanent cutting edges at all times.*

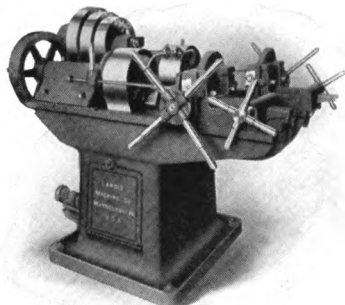


**Distinctive Features of The Landis Die:** 1. It has a *life* very many times that of any other. 2. The die *never* requires hobbing or retempering. 3. It will cut a *better thread* than any other. 4. The *clearance is correct*, permitting the highest possible cutting speeds. 5. The *rake* can be ground to suit the nature of the material to be threaded. 6. The *throat is permanent*, allowing close shoulder work at all times. 7. The *head locks within itself*, so that none of the cutting strain is carried by the yoke. 8. All *standard chasers are interchangeable*, and any one of a set can be replaced without renewing the entire die. 9. *High speed steel* can be used to better advantage than in any other style of die. 10. There is *no sliding motion of the chasers* to wear the holders and cause inaccuracy.

### BOLT CUTTERS

The action of the head is very simple yet effective; *the die being opened and closed either by the forward and backward movement of the carriages or by hand.*

The carriage is gibbed to the bed and can be shimmed to compensate for any wear that may occur. The vise has a horizontal side-wise as well as a vertical adjustment, insuring perfect and permanent alignment with the die. Special attention is given to the design of the *drive shaft and main spindle* and each machine is provided with a *die lubricating system.*



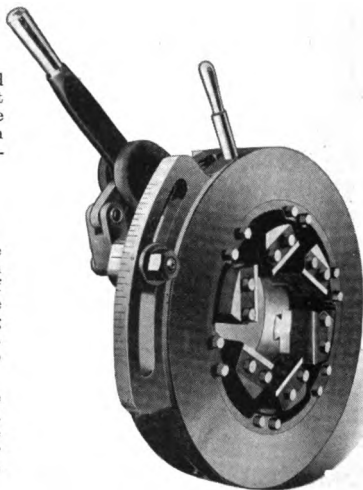
### PIPE AND NIPPLE THREADING MACHINES

Landis pipe and nipple machines are all equipped with **reaming devices** which remove the burr that forms during the cutting-off operation, while the pipe is threaded. **Nipple Grips** are provided with both plain and threaded gripping surfaces to receive the blank and threaded pipe ends.

### PIPE THREADING AND CUTTING OFF MACHINES

The chasers of the die head used on our pipe machines have universal movement to and from the center. One set will cover the entire range of the head, as long as the pitch is the same. The head is *manually operated* and under working conditions is locked within itself. The design of the head is such that it can readily be attached to many other pipe equipments.

The chucks furnished with these machines are lever operated allowing the pipe to be gripped and released while the machine is in action. The **lubricating systems**, safety appliances and other features are identical with those of the rotary type machines.



# LANDIS MACHINE CO., INC.

## SPECIFICATIONS OF STANDARD BOLT CUTTERS

| Type                    | Size             | Range                               | Die Equipment<br>(carbon steel)<br>Inches   | R. P. M.<br>Countershaft |               | Floor<br>Space<br>Required | Approx.<br>Net<br>Weight<br>Lbs. |
|-------------------------|------------------|-------------------------------------|---|--------------------------|---------------|----------------------------|----------------------------------|
|                         |                  |                                     |   | Carbon<br>Steel          | H.S.<br>Steel |                            |                                  |
| Single Head<br>Machines | $\frac{1}{2}$ "  | $\frac{1}{4}$ " to $\frac{1}{2}$ "  | 1 set each of $\frac{1}{4}$ , $\frac{3}{8}$ , $\frac{1}{2}$ , $\frac{5}{8}$ , and $\frac{3}{4}$ .   | 180                      | 300           | 1' 5"x4' 0"                | 850                              |
|                         | 1"               | $\frac{1}{2}$ " to 1"               | 1 set each of $\frac{1}{2}$ , $\frac{3}{4}$ , $\frac{1}{2}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ & 1   | 200                      | 300           | 2' 2"x4' 6"                | 1300                             |
|                         | $1\frac{1}{4}$ " | $\frac{3}{8}$ " to $1\frac{1}{4}$ " | 1 set each of $\frac{3}{8}$ , $\frac{1}{2}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ , 1, $1\frac{1}{8}$ and $1\frac{1}{4}$ .  | 300                      | 450           | 2' 2"x4' 8"                | 1400                             |
|                         | $1\frac{1}{2}$ " | $\frac{1}{2}$ " to $1\frac{1}{2}$ " | 1 set each of $\frac{1}{2}$ , $\frac{3}{4}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ , 1, $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ , and $1\frac{3}{4}$ .  | 280                      | 400           | 2' 2"x4' 8"                | 1400                             |
|                         | 2"               | $\frac{1}{2}$ " to 2"               | 1 set each of $\frac{1}{2}$ , $\frac{3}{4}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ , 1, $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ , $1\frac{3}{4}$ , and 2.   | 225                      | 400           | 2' 6"x6' 7"                | 2250                             |
|                         | $2\frac{1}{2}$ " | $\frac{3}{4}$ " to $2\frac{1}{2}$ " | 1 set each of $\frac{3}{4}$ , $\frac{7}{8}$ , 1, $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ , $1\frac{3}{4}$ , $1\frac{7}{8}$ , $1\frac{1}{2}$ , 2, $2\frac{1}{4}$ , and $2\frac{1}{2}$ .   | 300                      | 500           | 2' 6"x6' 7"                | 2300                             |
|                         | $2\frac{1}{2}$ " | $\frac{3}{4}$ " to $2\frac{1}{2}$ " | 1 set each of $\frac{3}{4}$ , $\frac{7}{8}$ , 1, $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ , $1\frac{3}{4}$ , $1\frac{7}{8}$ , $1\frac{1}{2}$ , 2, $2\frac{1}{4}$ , and $2\frac{1}{2}$ .   | 300                      | 500           | 2' 11"x8' 3"               | 2700                             |
|                         | 3"               | 1" to 3"                            | 1 set each of 1, $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ , $1\frac{3}{4}$ , $1\frac{7}{8}$ , $1\frac{1}{2}$ , $1\frac{3}{4}$ , $1\frac{7}{8}$ , 2, $2\frac{1}{4}$ , $2\frac{1}{2}$ , and 3.  | 325                      | 550           | 3' 4"x8' 9"                | 4300                             |
|                         | $3\frac{1}{2}$ " | 1" to $3\frac{1}{2}$ "              | 1 set each of 1, $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ , $1\frac{3}{4}$ , $1\frac{7}{8}$ , $1\frac{1}{2}$ , $1\frac{3}{4}$ , $1\frac{7}{8}$ , 2, $2\frac{1}{4}$ , $2\frac{1}{2}$ , $2\frac{3}{4}$ , 3, $3\frac{1}{4}$ , and $3\frac{3}{4}$ . | 285                      | 500           | 3' 4"x8' 9"                | 4400                             |
|                         | 4"               | $1\frac{1}{2}$ " to 4"              | 1 set each of $1\frac{1}{2}$ , $1\frac{3}{4}$ , $1\frac{7}{8}$ , $1\frac{3}{4}$ , $1\frac{7}{8}$ , $2\frac{1}{4}$ , $2\frac{1}{2}$ , $2\frac{3}{4}$ , 3, $3\frac{1}{4}$ , $3\frac{3}{4}$ , and 4.   | 240                      | 450           | 3' 4"x8' 9"                | 4550                             |
| Double Head<br>Machines | $\frac{1}{2}$ "  | $\frac{1}{4}$ " to $\frac{1}{2}$ "  | 2 sets each of $\frac{1}{4}$ , $\frac{3}{8}$ , $\frac{1}{2}$ , $\frac{5}{8}$ , and $\frac{3}{4}$ .  | 180                      | 300           | 2' 7"x4' 0"                | 1350                             |
|                         | 1"               | $\frac{1}{2}$ " to 1"               | 2 sets each of $\frac{1}{2}$ , $\frac{3}{4}$ , $\frac{1}{2}$ , $\frac{5}{8}$ , and $\frac{3}{4}$ , and 1 set each of $\frac{7}{8}$ , and 1.   | 200                      | 300           | 3' 6"x4' 10"               | 2250                             |
|                         | $1\frac{1}{4}$ " | $\frac{3}{8}$ " to $1\frac{1}{4}$ " | 2 sets each of $\frac{3}{8}$ , $\frac{1}{2}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , and $\frac{7}{8}$ and 1 set each of 1, $1\frac{1}{8}$ , and $1\frac{1}{4}$ .   | 300                      | 425           | 3' 6"x4' 10"               | 2300                             |
|                         | $1\frac{1}{2}$ " | $\frac{1}{2}$ " to $1\frac{1}{2}$ " | 2 sets each of $\frac{1}{2}$ , $\frac{3}{4}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ , and 1, and 1 set each of $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ , and $1\frac{3}{4}$ .   | 280                      | 400           | 3' 6"x4' 10"               | 2350                             |
|                         | 2"               | $\frac{1}{2}$ " to 2"               | 2 sets each of $\frac{1}{2}$ , $\frac{3}{4}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ , 1, $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ , and $1\frac{3}{4}$ , and 1 set each of 1 and 2.  | 225                      | 400           | 4' 0"x5' 10"               | 3750                             |
| Triple Head<br>Machines | 1"               | $\frac{1}{2}$ " to 1"               | 1 set each of $\frac{1}{2}$ , $\frac{3}{4}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ , and 1.  | 400                      | 550           | 5' 5"x4' 10"               | 3350                             |
|                         | $1\frac{1}{2}$ " | $\frac{1}{2}$ " to $1\frac{1}{2}$ " | 1 set each of $\frac{1}{2}$ , $\frac{3}{4}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ , 1, $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ , and $1\frac{3}{4}$ .  | 250                      | 360           | 5' 5"x4' 10"               | 3550                             |
|                         | 2"               | $\frac{1}{2}$ " to 2"               | 1 set each of $\frac{1}{2}$ , $\frac{3}{4}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ , 1, $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ , $1\frac{3}{4}$ , and 2.   | 500                      | 700           | 6' 2"x6' 0"                | 5000                             |

## Staybolt Machines

| Sin. Head | Size | Range | As desired | 225 | 360 | 2' 2"x7' 0" | 1650 |
|-----------|------|-------|------------|-----|-----|-------------|------|
| Dou. Head | Size | Range | As desired | 225 | 360 | 3' 6"x7' 0" | 3000 |

## SPECIFICATIONS OF STANDARD BOLT POINTERS

| Type                    | Size             | Range                               | Bushing Equipment  | R. P. M.<br>Countershaft |     | Floor<br>Space<br>Required | Weight |
|-------------------------|------------------|-------------------------------------|--|--------------------------|-----|----------------------------|--------|
| Single Head<br>Machines | $\frac{1}{4}$ "  | $\frac{1}{8}$ " to $\frac{3}{4}$ "  | 1 each $\frac{1}{4}$ , $\frac{3}{8}$ , $\frac{1}{2}$ , $\frac{5}{8}$ , and $\frac{3}{4}$ .   | 300                      | 400 | 1' 5"x4' 0"                | 850    |
|                         | $\frac{1}{2}$ "  | $\frac{1}{4}$ " to 1"               | 1 each $\frac{1}{2}$ , $\frac{3}{4}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ and 1.  | 400                      | 300 | 2' 2"x4' 2"                | 1300   |
|                         | $1\frac{1}{2}$ " | $\frac{1}{2}$ " to $1\frac{1}{2}$ " | 1 each $\frac{1}{2}$ , $\frac{3}{4}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ , 1, $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ and $1\frac{3}{4}$ .  | 300                      | 400 | 2' 2"x4' 8"                | 1400   |
|                         | 2"               | $\frac{1}{2}$ " to 2"               | 1 each $\frac{1}{2}$ , $\frac{3}{4}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ , 1, $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ , $1\frac{3}{4}$ , and 2.   | 400                      | 400 | 2' 6"x6' 7"                | 2250   |
|                         | 3"               | 1" to 3"                            | 1 each 1, $1\frac{1}{8}$ , $1\frac{1}{4}$ , $1\frac{1}{2}$ , $1\frac{3}{4}$ , $1\frac{7}{8}$ , $1\frac{1}{2}$ , $1\frac{3}{4}$ , $1\frac{7}{8}$ , 2, $2\frac{1}{4}$ , $2\frac{1}{2}$ , $2\frac{3}{4}$ and 3. | 550                      | 550 | 2' 6"x6' 7"                | 2300   |

## SPECIFICATIONS OF STANDARD PIPE AND NIPPLE MACHINES

| Type            | Size             | Range                               | Die Equipment<br>(carbon steel)                   | R. P. M.<br>Countershaft |     | Floor<br>Space<br>Required | Approx.<br>Net<br>Weight<br>Lbs. |
|-----------------|------------------|-------------------------------------|---|--------------------------|-----|----------------------------|----------------------------------|
| Sin. Head Mach. | $\frac{1}{2}$ "  | $\frac{1}{8}$ " to $\frac{1}{2}$ "  | 1 set each 27, 18 and 14 Pitch.                   | 180                      | 300 | 1' 5"x4' 0"                | 850                              |
|                 | $1\frac{1}{4}$ " | $\frac{1}{8}$ " to $1\frac{1}{4}$ " | 1 set each 27, 18, 14 and $11\frac{1}{2}$ Pitch.  | 300                      | 450 | 2' 2"x4' 2"                | 1400                             |
|                 | 2"               | $\frac{1}{4}$ " to 2"               | 1 set each 18, 14 and $11\frac{1}{2}$ Pitch.      | 225                      | 400 | 2' 6"x6' 7"                | 2250                             |
| Dou. Head Mach. | $\frac{1}{2}$ "  | $\frac{1}{8}$ " to $\frac{1}{2}$ "  | 2 sets each 27, 18 and 14 Pitch.                  | 180                      | 300 | 2' 7"x4' 0"                | 1350                             |
|                 | $1\frac{1}{4}$ " | $\frac{1}{8}$ " to $1\frac{1}{4}$ " | 2 sets each 27, 18, 14 and $11\frac{1}{2}$ Pitch. | 300                      | 425 | 3' 6"x4' 2"                | 2300                             |
|                 | 2"               | $\frac{1}{4}$ " to 2"               | 2 sets each 18, 14 and $11\frac{1}{2}$ Pitch.     | 225                      | 400 | 4' 0"x5' 4"                | 3750                             |

## SPECIFICATIONS OF STANDARD PIPE DIE HEADS

| Size | Range                  | Die Equipment | No. of Chasers per Head |
|------|------------------------|---------------|-------------------------|
| 4"   | $2\frac{1}{2}$ " to 4" | 1 set 8 pitch | 6                       |
| 6"   | $2\frac{1}{2}$ " to 6" | 1 set 8 pitch | 6                       |
| 8"   | 4" to 8"               | 1 set 8 pitch | 6                       |
| 12"  | 6" to 12"              | 1 set 8 pitch | 8                       |

# THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN.

MANUFACTURERS OF SPECIAL MACHINERY AND TOOLS

## SPECIAL THREADING TOOLS

In the manufacture of small parts, the demand for rapid and economical production, combined with higher standards of accuracy, has caused old methods of threading to be almost entirely discarded. To meet this demand the Geometric Special Threading Tools were placed on the market a number of years ago and have since been developed to a point where they are unequalled for accuracy and economy.

### GEOMETRIC SCREW-CUTTING DIE-HEAD

Self-opening and Adjustable

In the Geometric Die-head, the dies are opened automatically by simply stopping the travel of the turret slide when the desired length of thread is reached. Four or more accurately hobbled chasers or dies, of carbon or high-speed steel, carried in a substantial head, are used according to the diameter of the work. All Die-heads are equipped with micrometer scales by means of which a tight or loose fitting thread may be cut, also making it possible to compensate for wear of the dies. The saving thus effected through the greatly increased possible output and elimination of waste material through defective pieces, will soon far exceed in value the difference in the initial cost of a Geometric Die-head as compared with a solid die.

**Style "D"**—This type is designed for use on the turret of hand and automatic screw machines, in place of solid dies. A roughing and finishing attachment forms part of this style in sizes over and including  $\frac{3}{4}$  inch.

**Style "C"**—This style embraces special types for threading automobile parts, plumbers' supplies, bicycle parts, brass and iron fittings and for cutting standard iron pipe threads.

**Style "DD"** is especially designed for use in the turret of the Cleveland or similar automatic screw machines. The Die-head is supported by a spring mechanism between the head and the shank, which permits the chasers to compensate for any inaccuracy of adjustment of the turret.

### Solid Adjustable

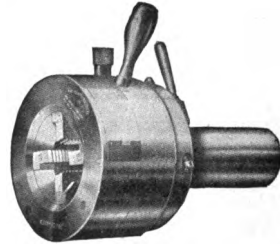
The Geometric Solid Adjustable Die-head is a special form of Die-head designed for use on automatic screw machines where the direction of rotation of the piece is reversed on the completion of the thread. The chasers are of the standard Geometric form and are interchangeable with those employed in the Styles "D" and "DD" Die-heads.

### GEOMETRIC ADJUSTABLE COLLAPSING TAPS.

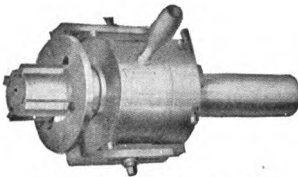
Where work of one inch or greater diameter has to be tapped, the advantages of Geometric Collapsible Taps are so numerous as to place them in a class entirely by themselves. They automatically collapse when the required depth has been reached, and can be instantly withdrawn without running back over the threads. Can be used on a live spindle, such as a drill press, as well as on a screw machine or turret lathe.

**Class "N-L" Collapsing Tap** is furnished to cut pipe threads from  $\frac{3}{4}$  to 12 inches in diameter inclusive. It may also be furnished for tapping other classes of work up to a maximum diameter of  $12\frac{3}{4}$  inches, and either in the plug or bottoming type.

**Class "P" Taps** are designed solely for tapping fine pitch threads of short depth. They can be furnished for cutting diameters from  $\frac{3}{4}$  inch up to 10 inches inclusive.



Style "D" Die-Head  
with Roughing Attachment



Class "N-L" Tap Equipped  
with Chasers for Bottoming



# THE GEOMETRIC TOOL COMPANY

## SPECIFICATIONS AND PRICES

| Size, Ins.   | Diam. of Head, Ins. | Length of Head, Ins. | Diam. of Shank, Ins.             | Length of Shank, Ins. | Length Over All, Inches | Capacity, Inches                 | Coarsest Pitch of Thread | Greatest Length will Cut, Ins.           | Price, including One Set of Dies for One Standard Pitch Thread | Extra Dies per set, Carbon Steel | Extra Dies per set, H. S. Steel | Blank Dies per set, Carbon Steel | Code Word |
|--|---------------------|----------------------|----------------------------------|-----------------------|-------------------------|----------------------------------|--------------------------|--|--|----------------------------------|---------------------------------|----------------------------------|-----------|
| <b>Style "D" Self-Opening and Adjustable Screw-Cutting Die-Heads</b> |                     |                      |                                  |                       |                         |                                  |                          |  |  |                                  |                                 |                                  |           |
| $\frac{1}{8}$  | $1\frac{3}{4}$      | $1\frac{3}{8}$       | $\frac{5}{8}$ or $\frac{3}{4}$   | $1\frac{3}{4}$        | $3\frac{1}{2}$          | $\frac{1}{8}$ to $\frac{3}{8}$   | 18                       | Any l'g'th when stand- and shank is used | \$25.00  | \$1.50                           | \$2.25                          | \$0.75                           | Pitch     |
| $\frac{1}{4}$  | $2\frac{1}{4}$      | $2\frac{1}{8}$       | $\frac{3}{4}$ or $1$             | $2\frac{1}{2}$        | $3\frac{1}{2}$          | $\frac{1}{4}$ to $\frac{1}{2}$   | 12                       |  | 30.00  | 1.75                             | 2.63                            | .90                              | Past      |
| $\frac{3}{8}$  | $3\frac{1}{4}$      | $3\frac{1}{8}$       | $1\frac{1}{4}$ or $1\frac{1}{2}$ | $3\frac{1}{2}$        | $3\frac{1}{2}$          | $\frac{3}{8}$ to $\frac{1}{2}$   | 10                       |  | 40.00  | 2.00                             | 3.00                            | 1.00                             | Push      |
| $1$  | $4\frac{1}{4}$      | $4\frac{1}{8}$       | $1\frac{3}{4}$ or $2$            | $4\frac{1}{2}$        | $4\frac{1}{2}$          | $\frac{1}{2}$ to $1$             | 8                        |  | 50.00  | 2.50                             | 3.75                            | 1.25                             | Pull      |
| $1\frac{1}{2}$   | $5\frac{1}{4}$      | $5\frac{1}{8}$       | $2\frac{1}{4}$ or $2\frac{3}{4}$ | $5\frac{1}{2}$        | $5\frac{1}{2}$          | $\frac{5}{8}$ to $1\frac{1}{2}$  | 6                        |  | 65.00  | 3.00                             | 4.50                            | 1.50                             | Pale      |
| $2$  | $6\frac{1}{4}$      | $6\frac{1}{8}$       | $2\frac{3}{4}$ or $3$            | $6\frac{1}{2}$        | $6\frac{1}{2}$          | $1$ to $2$                       | $4\frac{1}{2}$           |  | 80.00  | 3.50                             | 5.25                            | 1.75                             | Part      |
| $2\frac{1}{2}$   | $7\frac{1}{4}$      | $7\frac{1}{8}$       | $3$ or $4$                       | $7\frac{1}{2}$        | $7\frac{1}{2}$          | $1\frac{1}{2}$ to $2\frac{1}{2}$ | $4\frac{1}{2}$           |  | 95.00  | 4.00                             | 6.00                            | 2.00                             | Punt      |
| $3$  | $8\frac{1}{4}$      | $8\frac{1}{8}$       | $3\frac{1}{2}$ or $4\frac{1}{2}$ | $8\frac{1}{2}$        | $8\frac{1}{2}$          | $2$ to $3$                       | $3\frac{1}{2}$           |  | 135.00   | 5.00                             | 7.50                            | 2.50                             | Pet       |
| $3\frac{1}{2}$   | $9\frac{1}{4}$      | $9\frac{1}{8}$       | $4$ or $5\frac{1}{2}$            | $9\frac{1}{2}$        | $9\frac{1}{2}$          | $2\frac{1}{2}$ to $3\frac{1}{2}$ | $3\frac{1}{4}$           |  | 175.00   | 6.00                             | 9.00                            | 3.00                             | Pilf      |
| $4\frac{1}{2}$   | $11\frac{1}{4}$     | $11\frac{1}{8}$      | $5\frac{1}{2}$ or $7\frac{1}{2}$ | $11\frac{1}{2}$       | $11\frac{1}{2}$         | $3$ to $4\frac{1}{2}$            | $2\frac{3}{4}$           |  | 215.00   | 7.00                             | 10.50                           | 3.50                             | Pick      |
|  |                     |                      |                                  |                       |                         |                                  |                          |  | 275.00   | 10.00                            | 15.00                           | 5.00                             | Pike      |

|  |                |                |                                 |   |                 |                                 |    |                |         |        |        |       |      |
|--|----------------|----------------|---------------------------------|---|-----------------|---------------------------------|----|----------------|---------|--------|--------|-------|------|
| <b>Style "DD," Model 1911, Self-Opening and Adjustable Screw-Cutting Die-Heads</b> |                |                |                                 |   |                 |                                 |    |                |         |        |        |       |      |
| $\frac{1}{8}$  | $1\frac{3}{4}$ | $2\frac{1}{4}$ | $\frac{5}{8}$ to $1\frac{1}{4}$ | 5 | $7\frac{1}{4}$  | $\frac{1}{8}$ to $\frac{3}{8}$  | 18 | 2              | \$30.00 | \$1.50 | \$2.25 | ..... | Olam |
| $\frac{1}{4}$  | $2\frac{1}{4}$ | $2\frac{3}{8}$ | $\frac{3}{4}$ to $1\frac{1}{8}$ | 5 | $7\frac{3}{8}$  | $\frac{1}{4}$ to $\frac{1}{2}$  | 12 | 3              | 35.00   | 1.75   | 2.63   | ..... | Oak  |
| $\frac{3}{8}$  | $3\frac{1}{4}$ | $3\frac{3}{8}$ | $\frac{5}{8}$ to $1\frac{1}{8}$ | 5 | $8\frac{1}{8}$  | $\frac{3}{8}$ to $\frac{1}{2}$  | 10 | $3\frac{1}{2}$ | 45.00   | 2.00   | 3.00   | ..... | Otis |
| $1$  | $4\frac{1}{4}$ | $4\frac{3}{8}$ | $\frac{3}{4}$ to $2\frac{1}{4}$ | 5 | $9\frac{1}{8}$  | $\frac{1}{2}$ to $1$            | 8  | $4\frac{1}{2}$ | 55.00   | 2.50   | 3.75   | ..... | Opal |
| $1\frac{1}{4}$   | $5\frac{1}{4}$ | $5\frac{3}{8}$ | $1$ to $3\frac{1}{4}$           | 6 | $10\frac{1}{8}$ | $\frac{1}{2}$ to $1\frac{1}{4}$ | 7  | $4\frac{1}{2}$ | 70.00   | 3.00   | 4.50   | ..... | Ode  |

### Solid Adjustable Screw-Cutting Die-Heads

|               |                                   |                                |    |                           |         |        |        |        |       |
|---------------|-----------------------------------|--------------------------------|----|---------------------------|---------|--------|--------|--------|-------|
| $\frac{1}{8}$ | Fitted with Plain Shank.....      | $\frac{1}{8}$ to $\frac{3}{8}$ | 18 | Depend- ing on shank used | \$15.00 | \$1.50 | \$2.25 | \$0.75 | ..... |
| $\frac{1}{8}$ | Fitted with Releasing Holder..... |                                |    |                           | 17.50   |        |        |        |       |
| $\frac{1}{8}$ | Fitted with Gridley Holder.....   |                                |    |                           | 20.00   | 1.75   | 2.63   | .90    | ..... |
| $\frac{1}{4}$ | Fitted with Plain Shank.....      | $\frac{1}{4}$ to $\frac{1}{2}$ | 12 |                           | 20.00   |        |        |        |       |
| $\frac{1}{4}$ | Fitted with Releasing Holder..... |                                |    |                           | 22.50   |        |        |        |       |
| $\frac{1}{4}$ | Fitted with Gridley Holder.....   |                                |    |                           | 25.00   |        |        |        |       |
| $\frac{3}{8}$ | Fitted with Plain Shank.....      | $\frac{3}{8}$ to $\frac{1}{2}$ | 10 |                           | 25.00   | 2.00   | 3.00   | 1.00   | ..... |
| $\frac{3}{8}$ | Fitted with Releasing Holder..... |                                |    |                           | 27.50   |        |        |        |       |
| $\frac{3}{8}$ | Fitted with Gridley Holder.....   |                                |    |                           | 30.00   |        |        |        |       |
| $1$           | Fitted with Plain Shank.....      | $\frac{3}{8}$ to $1$           | 8  |                           | 35.00   | 2.50   | 3.75   | 1.25   | ..... |
| $1$           | Fitted with Releasing Holder..... |                                |    |                           | 37.50   |        |        |        |       |
| $1$           | Fitted with Gridley Holder.....   |                                |    |                           | 40.00   |        |        |        |       |

### Class "NL" Collapsing and Adjustable Pipe Taps

| Size, Ins.     | Largest Diameter of Head, Ins. | Length of Head  | Diameter of Shank, Ins.          | Length of Shank, Ins. | Morse Taper Shank | Length Over All, Ins. | Capacity, Standard Pipe Sizes, Ins. | Capacity, Straight Thread, Ins.    | Greatest Depth, Straight Tapping, Ins. | Coarsest Thr'ds per In. | Price, including One Set of Carbon Steel Chasers | Extra Chasers per Set, Carbon Steel | High Speed Steel | No. of Chasers per Set |
|----------------|--------------------------------|-----------------|----------------------------------|-----------------------|-------------------|-----------------------|-------------------------------------|------------------------------------|--|-------------------------|--|-------------------------------------|------------------|------------------------|
| $\frac{1}{8}$  | $2\frac{1}{4}$                 | $4\frac{1}{8}$  | $\frac{1}{8}$ to $\frac{3}{8}$   | $2\frac{1}{2}$        | No. 2             | $6\frac{1}{4}$        | $\frac{3}{4}$                       | $1\frac{1}{4}$ to $1\frac{1}{8}$   | $1\frac{1}{2}$                         | 14                      | \$40.00  | \$3.25                              | \$4.88           | 4                      |
| $\frac{1}{4}$  | $3\frac{1}{4}$                 | $5\frac{1}{8}$  | $\frac{1}{4}$ to $\frac{1}{2}$   | $3\frac{1}{2}$        | No. 3 or 4        | $10\frac{3}{8}$       | $1\frac{1}{2}$                      | $1\frac{3}{8}$ to $1\frac{3}{4}$   | $1\frac{1}{2}$                         | 11                      | 45.00  | 3.25                                | 4.88             | 4                      |
| $\frac{3}{8}$  | $4\frac{1}{4}$                 | $6\frac{1}{8}$  | $\frac{3}{8}$ to $\frac{1}{2}$   | $4\frac{1}{2}$        | No. 4             | $11\frac{1}{2}$       | $1\frac{1}{2}$                      | $1\frac{1}{2}$ to $2\frac{1}{4}$   | $1\frac{1}{2}$                         | 11                      | 50.00  | 3.25                                | 4.88             | 4                      |
| $\frac{1}{2}$  | $5\frac{1}{4}$                 | $7\frac{1}{8}$  | $\frac{1}{2}$ to $\frac{3}{4}$   | $5\frac{1}{2}$        | No. 4             | $11\frac{1}{2}$       | $2$                                 | $2\frac{1}{8}$ to $2\frac{3}{4}$   | $1\frac{1}{2}$                         | 11                      | 55.00  | 3.50                                | 5.25             | 4                      |
| $\frac{5}{8}$  | $6\frac{1}{4}$                 | $8\frac{1}{8}$  | $\frac{5}{8}$ to $1$             | $6\frac{1}{2}$        | No. 4 or 5        | $11\frac{1}{2}$       | $2\frac{1}{2}$                      | $2\frac{1}{2}$ to $3\frac{1}{4}$   | $1\frac{1}{2}$                         | 11                      | 60.00  | 3.50                                | 5.25             | 4                      |
| $1$            | $7\frac{1}{4}$                 | $9\frac{1}{8}$  | $1$ to $1\frac{1}{2}$            | $7\frac{1}{2}$        | No. 5             | $12\frac{1}{2}$       | $3$                                 | $3\frac{1}{8}$ to $4$              | $2\frac{1}{2}$                         | 8                       | 65.00  | 4.50                                | 6.75             | 6                      |
| $1\frac{1}{4}$ | $8\frac{1}{4}$                 | $10\frac{1}{8}$ | $1\frac{1}{4}$ to $1\frac{3}{4}$ | $8\frac{1}{2}$        | No. 5             | $12\frac{1}{2}$       | $3\frac{1}{2}$ & $4$                | $4\frac{1}{8}$ to $4\frac{1}{2}$   | $2\frac{1}{2}$                         | 8                       | 70.00  | 5.00                                | 7.50             | 6                      |
| $1\frac{1}{2}$ | $9\frac{1}{4}$                 | $11\frac{1}{8}$ | $1\frac{1}{2}$ to $2$            | $9\frac{1}{2}$        | No. 5 or 6        | $13\frac{1}{2}$       | $4$ & $4\frac{1}{2}$                | $4\frac{1}{4}$ to $5\frac{1}{8}$   | $2\frac{1}{2}$                         | 8                       | 75.00  | 5.00                                | 7.50             | 6                      |
| $2$            | $10\frac{1}{4}$                | $12\frac{1}{8}$ | $2$ to $2\frac{1}{2}$            | $10\frac{1}{2}$       | No. 5 or 6        | $14\frac{1}{2}$       | $4\frac{1}{2}$ & $5$                | $5\frac{1}{4}$ to $5\frac{3}{4}$   | $2\frac{1}{2}$                         | 8                       | 80.00  | 5.50                                | 8.25             | 6                      |
| $2\frac{1}{2}$ | $11\frac{1}{4}$                | $13\frac{1}{8}$ | $2\frac{1}{2}$ to $3$            | $11\frac{1}{2}$       | No. 5 or 6        | $14\frac{1}{2}$       | $5$ & $6$                           | $6\frac{1}{4}$ to $7\frac{3}{8}$   | $2\frac{1}{2}$                         | 8                       | 85.00  | 5.50                                | 8.25             | 6                      |
| $3$            | $12\frac{1}{4}$                | $14\frac{1}{8}$ | $3$ to $3\frac{1}{2}$            | $12\frac{1}{2}$       | No. 5 or 6        | $14\frac{1}{2}$       | $6$ & $7$                           | $7\frac{1}{4}$ to $8\frac{1}{8}$   | $2\frac{1}{2}$                         | 8                       | 90.00  | 6.00                                | 9.00             | 6                      |
| $3\frac{1}{2}$ | $13\frac{1}{4}$                | $15\frac{1}{8}$ | $3\frac{1}{2}$ to $4$            | $13\frac{1}{2}$       | No. 5 or 6        | $15\frac{1}{2}$       | $7$ & $8$                           | $8\frac{1}{4}$ to $9\frac{1}{8}$   | $2\frac{1}{2}$                         | 8                       | 100.00   | 6.00                                | 9.00             | 6                      |
| $4$            | $14\frac{1}{4}$                | $16\frac{1}{8}$ | $4$ to $4\frac{1}{2}$            | $14\frac{1}{2}$       | No. 5 or 6        | $15\frac{1}{2}$       | $8$ & $9$                           | $9\frac{1}{4}$ to $10\frac{1}{8}$  | $2\frac{1}{2}$                         | 8                       | 125.00   | 6.50                                | 9.75             | 6                      |
| $4\frac{1}{2}$ | $15\frac{1}{4}$                | $17\frac{1}{8}$ | $4\frac{1}{2}$ to $5$            | $15\frac{1}{2}$       | No. 5 or 6        | $15\frac{1}{2}$       | $9$ & $10$                          | $10\frac{1}{4}$ to $11\frac{1}{8}$ | $2\frac{1}{2}$                         | 8                       | 150.00   | 8.00                                | 12.00            | 8                      |
| $5$            | $16\frac{1}{4}$                | $18\frac{1}{8}$ | $5$ to $5\frac{1}{2}$            | $16\frac{1}{2}$       | No. 6             | $16\frac{1}{2}$       | $10$ to $12$                        | $12\frac{1}{4}$ to $13\frac{1}{8}$ | $2\frac{1}{2}$                         | 8                       | 175.00   | 8.00                                | 12.00            | 8                      |
| $6$            | $17\frac{1}{4}$                | $19\frac{1}{8}$ | $6$ to $6\frac{1}{2}$            | $17\frac{1}{2}$       | No. 6             | $16\frac{1}{2}$       | $10$ to $12$                        | $12\frac{1}{4}$ to $13\frac{1}{8}$ | $2\frac{1}{2}$                         | 8                       | 200.00   | 10.00                               | 15.00            | 10                     |

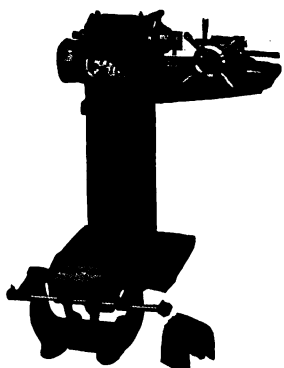
\* Shanks of special diameter and length can be furnished where required.

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(Continued from preceding pages)

## THE GEOMETRIC TOOL COMPANY

### GEOMETRIC THREADING MACHINE



Will produce accurate work in quantity and should not be confused with the usual run of bolt-threading machines. The machine is regularly equipped with a standard style "D" Die-head modified to meet the changed requirements of operation and with a range from  $\frac{1}{4}$  to  $\frac{3}{4}$  inches. Can be fitted for cutting standard screw threads up to and including 3-4"—10 pitch. A larger Die-head equips the machine for threading brass tubing and similar work up to 2" diameter, where the thread is not coarser than 22 pitch.

Speeds of machine spindle when countershaft is run at speed of 330 RPM.

|                           |                 |                 |                 |                 |                 |                 |
|---------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Gear Box. $\frac{1}{4}$ " | $\frac{1}{8}$ " | $\frac{3}{8}$ " | $\frac{1}{2}$ " | $\frac{1}{2}$ " | $\frac{3}{4}$ " | $\frac{1}{2}$ " |
| Speeds.... 225            | 180             | 150             | 128             | 112             | 100             | 90              |

#### COUNTERSHAFT

|                                 |                                     |
|---------------------------------|-------------------------------------|
| Driving Pulley.....             | $8\frac{1}{2}$ " x $2\frac{3}{4}$ " |
| Tight and Loose.....            | $7\frac{1}{2}$ " x $2\frac{3}{4}$ " |
| Speed.....                      | 330 RPM.                            |
| Net weight of Machine.....      | 394 lbs.                            |
| Net weight of Countershaft..... | 82 lbs.                             |
| Gross weight.....               | 567 lbs.                            |

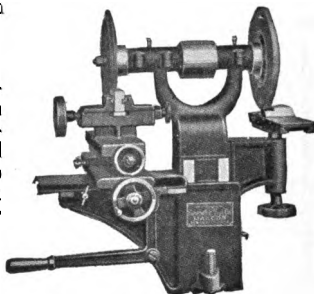
Price quoted after knowing requirements.

It can also be equipped with a Geometric Collapsing Tap or a Reversing Tap Holder for inside threads as well, according to the size of hole to be tapped. The range of tapping that is possible with this machine is from  $\frac{1}{8}$  inch to 2 inches, and even to 3 inches where the pitch of thread is fine.

### GEOMETRIC CHASER OR DIE GRINDER

Continued accuracy is naturally the chief requirement of all screw-cutting operations. With the Geometric Chaser or Die Grinder the difficulties of hand grinding are overcome and all chasers of a set may be ground uniformly to within a close limit of tolerance. It is adapted for grinding *any make* of thread chaser, whether of a stock or special type.

|                                  |          |
|----------------------------------|----------|
| Speed of countershaft.....       | 690 RPM  |
| Actual floor space required..... | 25 x 25" |
| Net weight of machine.....       | 230 lbs. |
| Net weight of countershaft.....  | 35 lbs.  |
| Gross weight.....                | 375 lbs. |



Chasers in Place for Grinding on Throat and Face

### GEOMETRIC ADJUSTABLE HOLLOW MILLING TOOL

These tools are specially designed for brass finishing and will be found most effective and economical for reducing duplicate parts to an exact diameter prior to threading. They can also be used for light cutting on cast iron, steel or similar material. They are made from solid bar steel and are extremely simple and durable.

#### SPECIFICATIONS AND PRICES

| Size, Ins.     | Diam. of Head, Ins. | Length of Head, Ins. | Diam. of Shank, Ins. | Length of Shank, Ins. | Length Over All, Ins. | Capacity with Complete Set of Cutters, Ins. | No. of Single Sets to a Complete Set | No. of Single Cutters to a Single Set | Price, incl'd g Complete Set of Carbon Steel Cutters | Extra Carbon Steel Cutters, per Single Set | Extra High-Speed Cutters, per Single Set | Code Word |
|----------------|---------------------|----------------------|----------------------|-----------------------|-----------------------|---|--------------------------------------|---------------------------------------|--|--|--|-----------|
| $\frac{1}{8}$  | $1\frac{1}{8}$      | $1\frac{1}{4}$       | $\frac{3}{8}$        | 3                     | $4\frac{1}{4}$        | $\frac{1}{8}$ to $\frac{3}{8}$              | 2                                    | 4                                     | \$12.00  | \$1.00                                     | \$1.50                                   | Turn      |
| $\frac{1}{4}$  | $2\frac{1}{4}$      | $1\frac{1}{2}$       | $1\frac{1}{4}$       | 4                     | $5\frac{1}{4}$        | $\frac{1}{4}$ to $\frac{1}{2}$              | 2                                    | 5                                     | 16.00  | 1.25                                       | 1.88                                     | Tire      |
| $\frac{3}{8}$  | $3\frac{1}{4}$      | $2\frac{1}{4}$       | $2\frac{1}{4}$       | 6                     | $7\frac{1}{4}$        | $\frac{3}{8}$ to $1\frac{1}{4}$             | 3                                    | 5                                     | 20.00  | 1.50                                       | 2.25                                     | Thine     |
| $\frac{1}{2}$  | $4\frac{1}{4}$      | $2\frac{3}{4}$       | $2\frac{3}{4}$       | 8                     | $9\frac{1}{4}$        | $1\frac{1}{4}$ to $2\frac{1}{2}$            | 3                                    | 5                                     | 30.00  | 1.50                                       | 2.25                                     | Tole      |
| $2\frac{1}{2}$ | $4\frac{1}{2}$      | $3\frac{1}{4}$       | $3\frac{1}{4}$       | 7                     | $10\frac{1}{4}$       | $1\frac{1}{2}$ to $2\frac{1}{2}$            | 4                                    | 5                                     | 35.00  | 1.50                                       | 2.25                                     | Tell      |
| $\frac{3}{4}$  | $5\frac{1}{4}$      | $3\frac{1}{2}$       | $3\frac{1}{2}$       | 8                     | $11\frac{1}{4}$       | $2\frac{1}{2}$ to $3\frac{1}{2}$            | 4                                    | 7                                     | 40.00  | 2.25                                       | 3.38                                     | Talk      |
| $3\frac{1}{2}$ | $6\frac{1}{4}$      | $4\frac{1}{2}$       | $4\frac{1}{2}$       | 9                     | $12\frac{1}{4}$       | $2\frac{1}{2}$ to $3\frac{1}{2}$            | 4                                    | 7                                     | 45.00  | 2.25                                       | 3.38                                     | Tick      |
| 4              | $6\frac{3}{4}$      | $4\frac{3}{4}$       | 5                    | 8                     | $13\frac{1}{4}$       | to 4  | 4                                    | 7                                     | 50.00  | 2.25                                       | 3.38                                     | Thank     |

## **IDEAL TOOL & MANUFACTURING CO.**

**BEAVER FALLS, PA.**

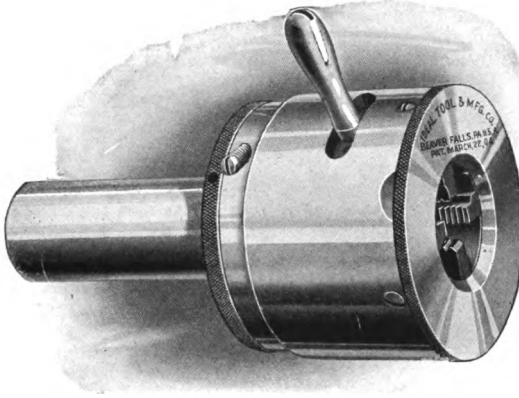
**MANUFACTURERS OF SCREW CUTTING DIES**

### **THE IDEAL OPENING DIE**

Six loose parts, all parts subject to wear, are hardened, such as CAM-HEAD holding Chasers and CLUTCH, thereby eliminating to a great degree the tendency to wear.

Chasers supported directly back of cutting edge, which eliminates tapered threads.

Revolving HEAD instead of CAM, which utilizes belt power or cutting strain, as an opening power.



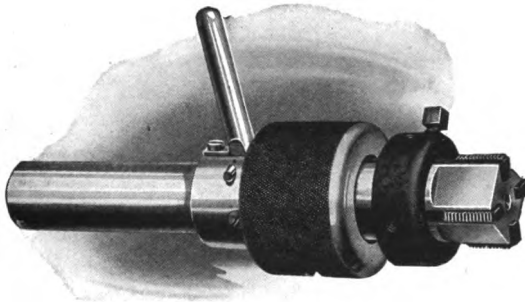
Send prints or samples of work, and we shall be pleased to give full information, regarding same.

Dies sent on trial, subject to your inspection, and if not satisfactory, can be returned without any expense to yourselves.

### **IDEAL COLLAPSING TAP**

Four loose parts, all parts subject to wear hardened.

Sizes range from  $\frac{3}{4}$ " to 6".



Write for information, regarding same.

## MODERN TOOL COMPANY

ERIE, PA., U. S. A.

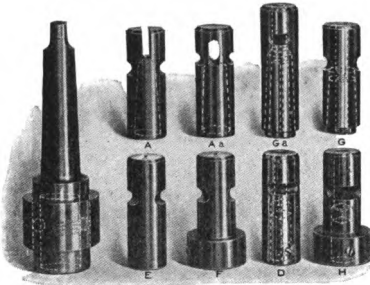
MAKERS OF THREADING TOOLS AND GRINDERS

### "MODERN" SELF OPENING AND ADJUSTABLE DIE HEADS

The "Modern" Die is universal in its application and use, being adapted for revolving spindles as well as turret lathes and screw machines; and a single style of head will cut any shaft or pitch of thread for any length desired. Made in sizes to thread any diameter from  $\frac{1}{16}$ " to 6". The "Modern" is the only Die having a cam ring and chaser block for supporting the cutting dies or that may be thoroughly cleaned without removing the Head from the machine.



"Modern" Self Opening Die



"Magic" Chuck and Collets

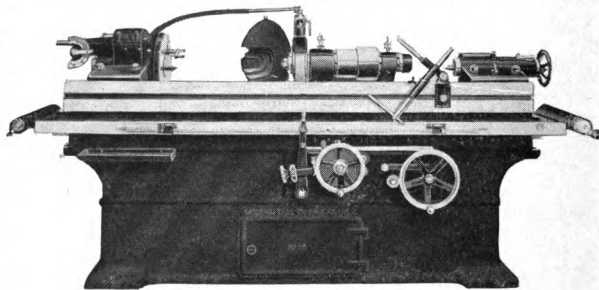
### "MAGIC" CHUCK EQUIPMENT

For the rapid changing of tools in drill press, lathe, screw machine, etc., without stopping the machine, practically converting a single spindle machine into a multiple spindle one, with as many tools as you may have operations. Made in sizes to take up to 3" diameter drills. Try it and save labor cost.

### "MODERN" GRINDING MACHINES

Much unnecessary weight is eliminated and perfect rigidity and freedom from vibration secured by the scientific distribution of material in "Modern" Grinding Machines.

Generous bearings for all moving parts reduce the possibility of wearing and prevent absolutely all chatter. Centralization of working parts secures perfect transmission of power to the working point. Accessibility of the working parts for care and attention by the operator



"Modern" Grinding Machine

makes minimum loss of use, cost of up-keep and depreciation. Improved operative features insure large production and precision work.

### ALL "MODERN" TOOLS GUARANTEED TO BE SATISFACTORY TO THE USER

Complete information concerning products will be mailed interested parties upon request.

# THE BORDEN COMPANY

WARREN, OHIO

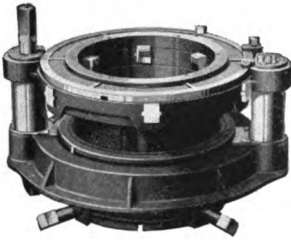
MANUFACTURERS OF HIGH GRADE TOOLS FOR CUTTING AND  
THREADING PIPE.

## BEAVER DIE STOCKS

For many years it was considered necessary in cutting a pipe thread to use a tapered die—a stationary deep die with as many teeth as the thread to be cut. *The Beaver principle revolutionizes all pre-conceived ideas.* It cuts a tapered thread with a narrow die similar to a lathe tool by moving or expanding the die while the thread is being cut. *The further you cut the thread the easier is the labor.* The Beaver Die cuts the same thread but cuts it easier—fewer teeth—less friction.



No. 25, 1"-2" Beaver



No. 80, 4½"-8" Beaver

The No. 25 and 26 BEAVER DIE STOCKS are the only Easy Cutting Tools made with a universal chuck. Not necessary to change dies when you use a "Beaver." All Dies made of Vanadium Steel. The Nos. 41, 60 and 80 are Die Stocks with the capacity of machines but so compact and light that threads are easily cut on the pipe in a ditch as well as at the bench. We guarantee one man can cut an 8" thread.

| No. | Description  | Threading Range                            | List    | Shipping Weight |
|-----|--|--|---------|-----------------|
| 6   | ¼"-¾" Regular Stock.   | ¼, ⅜, ½ and ¾" Two sets dies—no changing.  | \$15.00 | 10 lbs.         |
| 25  | 1"-2" Regular Stock.   | 1, 1¼, 1½ and 2". One set dies.            | 30.00   | 25 lbs.         |
| 26  | 1"-2" Ratchet Stock.   | 1, 1¼, 1½ and 2". One set dies.            | 35.00   | 30 lbs.         |
| 30  | 2"-3" Special Ratchet Stock. 11½ thread pitch for oil well work. | 2, 2½ and 3". One set dies.                | 60.00   | 80 lbs.         |
| 41  | 2½"-4" Ratchet Stock.  | 2½, 3, 3½ and 4". One set dies.            | 110.00  | 100 lbs.        |
| 60  | 2½"-6" Ratchet Die Stock.  | 2½, 3, 3½, 4, 4½, 5 and 6". Two sets dies. | 220.00  | 200 lbs.        |
| 80  | 4½"-8" Ratchet Die Stock.  | 4½, 5, 6, 7 and 8". Two sets dies.         | 300.00  | 230 lbs.        |

## BEAVER SQUARE-END PIPE CUTTERS



The BEAVER SQUARE-END PIPE CUTTER is the first practical hand tool ever made which actually *cuts* the pipe, removing the metal as in a lathe. Has one set of knives—no changing—no feeding required—centering the tool on the pipe puts the knives in position. They automatically feed in until pipe is cut clear through. Faster than wheel cutters.

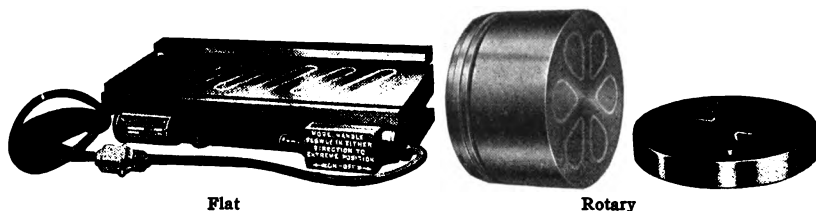
| No. | Cutting Range | List    | Extra Knives | Shipping Weight |
|-----|---------------|---------|--------------|-----------------|
| 1   | ⅛"-1"         | \$18.00 | \$1.20       | 8 lbs.          |
| 5   | ½"-2"         | 20.00   | 1.50         | 13 lbs.         |
| 10  | 2½"-4"        | 90.00   | 2.50         | 53 lbs.         |

**D & W FUSE COMPANY**

PROVIDENCE, R. I.

**"D & W" MAGNETIC CHUCKS**

Oil-Proof and Waterproof



Flat

Rotary

The flat chucks are equipped with adjustable end and side stops, providing convenient means for locating and steadying the work on the surface of the chucks.

The vertical chucks have a perpendicular holding face when clamped to a horizontal machine platen. They are especially adapted for use on grinders having a cup wheel on a horizontal spindle, but are otherwise similar to the flat chucks.

The above illustration of the rotary chuck shows same with an auxiliary plate. These plates are used as jigs or fixtures for the holding of special or irregular shaped pieces. By means of these plates, one chuck can be made to cover a wide range of operations, as any number of plates can be used with one chuck. For use on 105-125-volt direct current circuits, but can be furnished for higher voltages when specified.

Magnetic chucks can only be operated on direct current circuits.

**FLAT**

| Style   | Extreme Holding Face Inches         | Extreme Base Dimensions Inches     | Height Inches   | Price Each |
|---------|-------------------------------------|------------------------------------|-----------------|------------|
| F-7-8   | 8 $\frac{3}{4}$ x 7                 | 8 $\frac{3}{4}$ x 6                | 4               | \$ 50.00   |
| F-5-13  | 13 x 5 $\frac{1}{2}$                | 13 x 4 $\frac{1}{2}$               | 3 $\frac{1}{2}$ | 50.00      |
| F-7-16  | 16 $\frac{1}{4}$ x 7                | 16 $\frac{1}{4}$ x 6 $\frac{1}{2}$ | 3 $\frac{1}{4}$ | 70.00      |
| F-8-20  | 20 $\frac{1}{4}$ x 9 $\frac{1}{2}$  | 20 $\frac{1}{4}$ x 8               | 3 $\frac{3}{8}$ | 100.00     |
| F-10-31 | 31 $\frac{1}{2}$ x 10 $\frac{1}{4}$ | 31 $\frac{1}{2}$ x 9 $\frac{1}{2}$ | 4 $\frac{1}{4}$ | 135.00     |
| F-13-21 | 21 x 13 $\frac{3}{4}$               | 21 x 12                            | 4 $\frac{1}{4}$ | 120.00     |
| F-13-33 | 33 $\frac{1}{4}$ x 13 $\frac{3}{4}$ | 33 $\frac{1}{4}$ x 12              | 4 $\frac{1}{4}$ | 160.00     |
| F-10-46 | 46 $\frac{1}{4}$ x 10 $\frac{1}{2}$ | 46 $\frac{1}{4}$ x 9 $\frac{1}{2}$ | 4 $\frac{1}{4}$ | Special    |

**VERTICAL**

|         |       |       |                  |         |
|---------|-------|-------|------------------|---------|
| V-11-12 | 12x11 | 8x12  | 11 $\frac{1}{8}$ | \$85.00 |
| V-15-12 | 12x15 | 8x12  | 15               | 100.00  |
| V-19-12 | 12x19 | 10x12 | 19               | 120.00  |
| V-24-12 | 12x24 | 12x12 | 24               | 140.00  |

**ROTARY**

| Style | Diameter Inches | Width to Face Plate Seat, Inches | Diameter of Face Plate Seat, Inches | Price Each |
|-------|-----------------|----------------------------------|-------------------------------------|------------|
| R-3   | 4 $\frac{1}{8}$ | 2 $\frac{1}{2}$                  | No. 5 Morse Taper                   | \$30.00    |
| R-6   | 6               | 3 $\frac{1}{4}$                  | 4                                   | 40.00      |
| R-8   | 8               | 3 $\frac{3}{4}$                  | 4 $\frac{3}{8}$                     | 50.00      |
| R-10  | 10              | 3 $\frac{3}{4}$                  | 4 $\frac{3}{8}$                     | 62.00      |
| R-12  | 12              | 4 $\frac{1}{8}$                  | 5                                   | 82.00      |
| R-14  | 14              | 4 $\frac{1}{8}$                  | 7                                   | Special    |
| R-16  | 16              | 4 $\frac{1}{8}$                  | 7                                   | Special    |
| R-18  | 18              | 4 $\frac{1}{8}$                  | 8                                   | Special    |
| R-20  | 20              | 4 $\frac{1}{8}$                  | 8                                   | Special    |
| R-24  | 24              | 5 $\frac{1}{8}$                  | 10                                  | Special    |

In ordering chucks, specify the voltage of lighting circuit.

**PETER BROS. MANUFACTURING CO.**NOT INCORPORATED  
ALGONQUIN, ILL.**MANUFACTURERS OF TAPPING CHUCKS, AUTOMATIC REVERSING  
ATTACHMENTS AND TAPPING MACHINES****WOODSTOCK IMPROVED SAFETY TAPPING CHUCKS**

These chucks have been in constant use for over five years, and have successfully performed the most difficult and exacting work known, such as tapping tough materials, blind tapping, and bottom tapping in shallow holes, where a stop on machine is utterly worthless. They will work to full length of tap or where threads are only one or two deep.

When tap binds in work or reaches the bottom of hole, the Safety Tapping Chuck automatically releases and prevents tap from breaking. With this chuck you are able to get 95% of the strength of your tap without breaking it.

Friction from spring pressure always remains uniform, and as the pressure is constant there is no loss of power from slipping or wear.

**Construction**

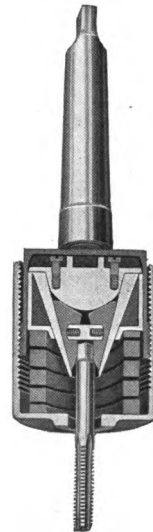
Pressure is put on friction cone by a spring and maintained as delicately and accurately as the best spring scale. Friction cone being conical renders it very sensitive as well as powerful. Tap is held by square, instead of the round part.

It is practically impossible to break taps with this chuck. Tap can be changed and friction put on without danger of error in adjustment.

Simply screw up the shell until it corresponds with graduation on body of chuck. When the lower portion of the chuck is screwed up, it compresses the spring to the proper degree for the tap being used.

| Size | Capacity   | Shank<br>Morse Taper | List Price |
|------|--|----------------------|------------|
| A    | No. 0 $\frac{1}{16}$ " $\frac{1}{8}$ " $\frac{3}{32}$ " $\frac{7}{32}$ " $\frac{1}{2}$ " $\frac{5}{8}$ "     | No. 1                | \$12.00    |
| B    | No. 6 $\frac{5}{32}$ " $\frac{11}{64}$ " $\frac{7}{16}$ " $\frac{13}{32}$ " $\frac{1}{2}$ " $\frac{7}{8}$ "  | Nos. 1 & 2           | \$16.00    |
| C    | No. 14 $\frac{1}{4}$ " $\frac{9}{32}$ " $\frac{11}{16}$ " $\frac{21}{32}$ " $\frac{11}{8}$ " $\frac{3}{4}$ " | Nos. 2 & 3           | \$20.00    |
| D    | $\frac{7}{16}$ " $\frac{15}{32}$ " $\frac{1}{2}$ " $\frac{17}{32}$ " $\frac{9}{16}$ " $\frac{5}{8}$ "        | Nos. 3 & 4           | \$26.00    |
| E    | $\frac{11}{16}$ " $\frac{3}{4}$ " $\frac{13}{16}$ " $\frac{7}{8}$ " $\frac{5}{8}$ " $1$ "                    | Nos. 4 & 5           | \$34.00    |

All Sizes Made in Straight Shanks at Same Price.



Sectional View

We supply parts for old-style Safety Chucks, manufactured by the Woodstock Safety Chuck Co., of Woodstock, Ill.

**WOODSTOCK REVERSING TAPPING ATTACHMENT** is made in two sizes, for drill press, lathe and screw machine, the No. 1 with No. 1, 2 or 3 Morse taper shank, and the No. 2 with No. 3 or 4 Morse taper shank.

This reversing attachment is simple, compact and sturdy. Gears are cut from high grade steel and run in grease, it automatically reverses direction of tap by merely raising spindle of drill press, and used in connection with our Safety Tapping Chuck, makes an ideal tool. Can be used horizontal, as well as vertical.

**WOODSTOCK TAPPING AND THREADING MACHINE** is made in one size only, and will take from No. 0 to  $\frac{3}{8}$  in. tap, tight and loose pulleys 5 in. in diameter,  $1\frac{1}{4}$  in. belt.

The operation is by a sliding clutch, which makes it practically solid when work is brought against the tool, no strain being on the gears, which simply reverse the spindle when the work is drawn back.

# NORTON COMPANY

WORCESTER, MASS., U. S. A.

NEW YORK STORE  
151 Chambers St.

CHICAGO STORE  
11 N. Jefferson St.

Electric Furnace Plants  
NIAGARA FALLS, N. Y.—CHIPPAWA, CAN.

Manufacturing Plants  
WORCESTER, MASS.—WESSELING, GERMANY.

**ALUNDUM AND CRYSTOLON GRINDING WHEELS, ALUNDUM AND CRYSTOLON GRAIN FOR POLISHING, ALUNDUM REFRACTORIES AND LABORATORY WARE, GLASS CUTTING WHEELS, INDIA OIL STONES AND CRYSTOLON SHARPENING STONES, RAZOR HONES, SCYTHE STONES, VALVE GRINDING COMPOUND, RUBBING BRICKS AND STONES, GRINDING WHEEL DRESSERS, GRINDING MACHINERY.**

**ALUNDUM** ( $Al_2O_3$ ) is made from Bauxite by fusion in an electric arc furnace. Its hardness, sharpness and toughness—"temper"—are under control. This in combination with its characteristic conchoidal fracture, makes Alundum grinding wheels peculiarly effective upon materials of high tensile strength—notably steel and its alloys.

**CRYSTOLON** is Silicon Carbide ( $SiC$ ) in crystalline formation. By the use of the purest materials and a scientifically correct process, an abrasive material of wonderful purity and remarkable cutting qualities is obtained. Its characteristic property of brittleness makes it highly efficient upon cast iron, brass, marble and other materials of low tensile strength.

The majority of Norton Grinding Wheels are made by the Vitrified process, in which the materials constituting the formulæ are mixed in power mixing kettles. Most Norton Wheels over 30" diameter are made by the Silicate process, the bond and grain being mixed by special machinery.

Elastic wheels are made in molds and baked at low temperature. They possess a high degree of safety, making them particularly valuable for operations requiring thin wheels. We make them as thin as  $\frac{3}{8}$ " up to 4" diameter,  $\frac{1}{16}$ " thick up to 8" diameter and  $\frac{1}{8}$ " thick up to 12" diameter. Used to great extent for saw gumming, grinding between teeth of gears, wood working tools, etc. Also especially adapted for roll grinding.

Wheels larger than 5" diameter are tested at 9000 surface feet per minute. As the usual working speeds are from 5000 to 6000 feet, these tests insure a high factor of safety.

**REFRACTORIES**—Until the invention of the process for making Alundum, Bauxite was considered infusible. This well-known property has made Alundum especially valuable as a refractory material. Alundum is made into Electric Furnace Cores, Tubes and Muffles; Crucibles, Combustion Boats, Filtering Crucibles and Cones, Extraction Thimbles and Refractory Cements.

Any of these Booklets will be sent on request:

Alundum  
Catalog of Grinding Wheels  
Alundum-Crystolon Grinding Wheels  
Alundum Grain for Polishing

Norton Refractories—Alundum and Crystolon  
Helps—Don't's for All Who Grind  
Grinding Wheels for the Saw Mill  
Norton Valve Grinding Compound  
Alundum and Crystolon in the Glass Industry.

**SPECIAL RESEARCH SERVICE**—We have well-equipped research laboratories with a competent staff of research workers and demonstrators who are always ready to give you the benefit of their special knowledge and wide experience in the solving of your special problems.

**Alundum**



**Crystolon**



# THE KNICKERBOCKER COMPANY

## JACKSON, MICH.

MANUFACTURERS OF DUST COLLECTORS AND CONCRETE MIXERS

### THE MORSE RARIFIED DUST COLLECTOR

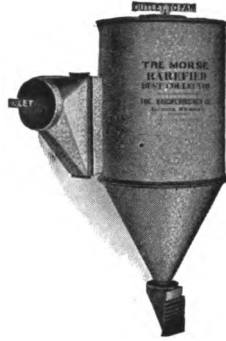
For Emery Wheels, Polishers, Sand Blast and Tumbling Mills

This Collector operates on the "Rarefied" or partial vacuum principle, a constant vacuum tendency being maintained in the collector casing and a separation of the material from the air current secured *before the air reaches the fan*. In handling all products of metallic or flinty character, this feature of the "Rarefied" is particularly valuable as the abrasion on the fan parts is eliminated, while there is no undue wear on the collector parts.

With the "Rarefied" Collector—The suction never varies, all dust heavier than air is collected, material separated is discharged automatically, there is no cleaning out by hand, there is no cloth or screens to fill up, there are no moving parts, the cost of repairs is slight.

This Collector is built all galvanized sheet steel with angle iron rings. All parts riveted two inch centers. Gauge of sheet steel used depends on suction required to do the work and class of material to be handled.

The "Rarefied" must be placed ahead of the fan with the latter always exhausting to the atmosphere above the roof. Size of "Rarefied" to be used must be two numbers larger than diameter of suction pipe. If fan has 12 inch suction pipe, at least a No. 14 "Rarefied" should be installed, etc.



| No. | Height<br>Top<br>Wall | Length<br>of<br>Cone | Length<br>of<br>Trap | Height<br>Over<br>All | Outside<br>Diam. | Inlet<br>Opening | Area  | Diam.<br>Outlet<br>Leading<br>to Fan | Diam.<br>Dust<br>Outlet |
|-----|-----------------------|----------------------|----------------------|-----------------------|------------------|------------------|-------|--------------------------------------|-------------------------|
| 2   | 15½"                  | 11½"                 | 10½"                 | 3' 1½"                | 15"              | 1¾" x 8½"        | 15"   | 2"                                   | 2"                      |
| 3   | 18"                   | 13½"                 | 10½"                 | 3' 6"                 | 17"              | 2¼" x 10"        | 22½"  | 3"                                   | 3"                      |
| 4   | 20½"                  | 15½"                 | 10½"                 | 3' 10½"               | 19"              | 2¾" x 11½"       | 31½"  | 4"                                   | 3"                      |
| 5   | 23"                   | 17½"                 | 10½"                 | 4' 3"                 | 21"              | 3¼" x 13"        | 42"   | 5"                                   | 3"                      |
| 6   | 2' 1½"                | 19½"                 | 10½"                 | 4' 7½"                | 1' 11"           | 3½" x 14½"       | 51"   | 6"                                   | 3"                      |
| 7   | 2' 4"                 | 21½"                 | 10½"                 | 5' 0"                 | 2' 1"            | 4" x 16"         | 64"   | 7"                                   | 3"                      |
| 8   | 2' 6½"                | 22"                  | 11½"                 | 5' 4"                 | 2' 3"            | 4½" x 17½"       | 79"   | 8"                                   | 4"                      |
| 9   | 2' 10"                | 2' 0"                | 11½"                 | 5' 9½"                | 2' 5"            | 5" x 20"         | 100"  | 9"                                   | 4"                      |
| 10  | 3' 0½"                | 2' 2"                | 11½"                 | 6' 2"                 | 2' 7"            | 5½" x 21½"       | 118½" | 10"                                  | 4"                      |
| 11  | 3' 3"                 | 2' 4"                | 11½"                 | 6' 6½"                | 2' 9"            | 6" x 23"         | 138"  | 11"                                  | 4"                      |
| 12  | 3' 5½"                | 2' 5"                | 13"                  | 6' 11½"               | 2' 11"           | 6½" x 24½"       | 159½" | 12"                                  | 5"                      |
| 13  | 3' 8"                 | 2' 7"                | 13"                  | 7' 4"                 | 3' 1"            | 7" x 26"         | 182"  | 13"                                  | 5"                      |
| 14  | 3' 10½"               | 2' 9"                | 13"                  | 7' 8½"                | 3' 3"            | 7½" x 27½"       | 206½" | 14"                                  | 5"                      |
| 15  | 4' 1"                 | 2' 11"               | 13"                  | 8' 1"                 | 3' 5"            | 8" x 29"         | 232"  | 15"                                  | 5"                      |
| 16  | 4' 3½"                | 3' 0"                | 14½"                 | 8' 4½"                | 3' 7"            | 8½" x 30½"       | 259½" | 16"                                  | 6"                      |
| 17  | 4' 6"                 | 3' 2"                | 14½"                 | 8' 10½"               | 3' 9½"           | 9" x 32"         | 288"  | 17"                                  | 6"                      |
| 18  | 4' 8½"                | 3' 4"                | 14½"                 | 9' 3"                 | 3' 11½"          | 9½" x 33½"       | 318½" | 18"                                  | 6"                      |
| 19  | 4' 11"                | 3' 6"                | 14½"                 | 9' 7½"                | 4' 1½"           | 10" x 35"        | 350"  | 19"                                  | 6"                      |
| 20  | 5' 1½"                | 3' 7"                | 16"                  | 10' 0½"               | 4' 3½"           | 10½" x 36½"      | 383½" | 20"                                  | 7"                      |
| 21  | 5' 4"                 | 3' 9"                | 16"                  | 10' 5"                | 4' 5½"           | 11" x 38"        | 418"  | 21"                                  | 7"                      |
| 22  | 5' 6½"                | 3' 11"               | 16"                  | 10' 9½"               | 4' 7½"           | 11½" x 39½"      | 454½" | 22"                                  | 7"                      |
| 23  | 5' 9"                 | 4' 0"                | 16"                  | 11' 1"                | 4' 9½"           | 12" x 41"        | 492"  | 23"                                  | 7"                      |
| 24  | 5' 11½"               | 4' 3"                | 16"                  | 11' 6½"               | 4' 11½"          | 12½" x 42½"      | 531½" | 24"                                  | 7"                      |
| 25  | 6' 2"                 | 4' 5"                | 16"                  | 11' 11"               | 5' 1½"           | 13" x 44"        | 572"  | 25"                                  | 7"                      |
| 26  | 6' 4½"                | 4' 7"                | 16"                  | 12' 3½"               | 5' 3½"           | 13½" x 45½"      | 614½" | 26"                                  | 7"                      |
| 27  | 6' 7"                 | 4' 9"                | 16"                  | 12' 8"                | 5' 5½"           | 14" x 47"        | 658"  | 27"                                  | 7"                      |
| 28  | 6' 9½"                | 4' 10"               | 17½"                 | 13' 1"                | 5' 7½"           | 14½" x 48½"      | 703½" | 28"                                  | 8"                      |
| 29  | 7' 0½"                | 5' 0"                | 17½"                 | 13' 6"                | 5' 9½"           | 15" x 50½"       | 757½" | 29"                                  | 8"                      |
| 30  | 7' 3"                 | 5' 2"                | 17½"                 | 14' 0"                | 5' 11½"          | 15½" x 52"       | 813"  | 30"                                  | 8"                      |
| 31  | 7' 5½"                | 5' 4"                | 17½"                 | 14' 4½"               | 6' 1½"           | 16" x 53½"       | 864"  | 31"                                  | 8"                      |
| 32  | 7' 8"                 | 5' 6"                | 17½"                 | 14' 8"                | 6' 3½"           | 16½" x 55"       | 907"  | 32"                                  | 8"                      |
| 33  | 7' 10½"               | 5' 8"                | 17½"                 | 14' 11½"              | 6' 5½"           | 17" x 56½"       | 960"  | 33"                                  | 8"                      |
| 34  | 8' 1"                 | 5' 10"               | 17½"                 | 15' 6"                | 6' 7½"           | 17½" x 58"       | 1015" | 34"                                  | 8"                      |
| 35  | 8' 3½"                | 6' 0"                | 17½"                 | 15' 8½"               | 6' 9½"           | 18" x 59½"       | 1071" | 35"                                  | 8"                      |
| 36  | 8' 6"                 | 6' 2"                | 17½"                 | 16' 1"                | 6' 11½"          | 18½" x 61"       | 1107" | 36"                                  | 8"                      |
| 37  | 8' 8½"                | 6' 4"                | 17½"                 | 16' 5½"               | 7' 1½"           | 19" x 62½"       | 1180" | 37"                                  | 8"                      |
| 38  | 8' 11½"               | 6' 6"                | 17½"                 | 16' 10"               | 7' 3½"           | 19½" x 64"       | 1248" | 38"                                  | 8"                      |
| 39  | 9' 1"                 | 6' 8"                | 17½"                 | 17' 2½"               | 7' 5½"           | 20" x 65½"       | 1310" | 39"                                  | 8"                      |
| 40  | 9' 3½"                | 6' 10"               | 17½"                 | 17' 7"                | 7' 7½"           | 20½" x 67"       | 1373" | 40"                                  | 8"                      |

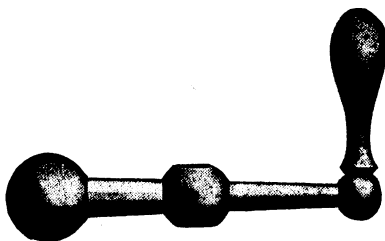
**THE CINCINNATI BALL CRANK CO.**

CINCINNATI, OHIO

**STEEL PRODUCTS****HANDLES FROM STEEL**

For power tools and similar purposes

Milled from the bar, drilled, faced and key-wayed to specifications. Highly finished, accurate, complete on receipt and ready to attach.

**STEEL BALL CRANK MACHINE HANDLES**

| No. | Length<br>Over All | Center<br>Ball | Large<br>End Ball | Small<br>End Ball |
|-----|--------------------|----------------|-------------------|-------------------|
| 0   | 3                  | $\frac{3}{8}$  | 1                 | $\frac{5}{8}$     |
| 1   | $3\frac{1}{2}$     | 1              | $1\frac{1}{8}$    | $\frac{5}{8}$     |
| 2   | $3\frac{1}{2}$     | $1\frac{1}{8}$ | $1\frac{1}{8}$    | $\frac{5}{8}$     |
| 3   | $4\frac{1}{2}$     | $1\frac{1}{8}$ | $1\frac{1}{8}$    | $\frac{5}{8}$     |
| 4   | $4\frac{1}{2}$     | $1\frac{1}{8}$ | $1\frac{1}{8}$    | $\frac{5}{8}$     |
| 5   | $5\frac{1}{2}$     | $1\frac{1}{8}$ | $1\frac{1}{8}$    | $\frac{5}{8}$     |
| 6   | $5\frac{1}{2}$     | $1\frac{1}{8}$ | $1\frac{1}{8}$    | $\frac{5}{8}$     |
| 7   | $6\frac{1}{2}$     | $1\frac{1}{8}$ | $1\frac{1}{8}$    | $\frac{5}{8}$     |
| 8   | $6\frac{1}{2}$     | $1\frac{1}{8}$ | $1\frac{1}{8}$    | $\frac{5}{8}$     |
| 9   | $7\frac{1}{2}$     | $1\frac{1}{8}$ | $1\frac{1}{8}$    | $\frac{5}{8}$     |
| 10  | $7\frac{1}{2}$     | $1\frac{1}{8}$ | $1\frac{1}{8}$    | $\frac{5}{8}$     |
| 11  | $8\frac{1}{2}$     | $1\frac{1}{8}$ | $1\frac{1}{8}$    | $\frac{5}{8}$     |
| 12  | $8\frac{1}{2}$     | $1\frac{1}{8}$ | $1\frac{1}{8}$    | $\frac{5}{8}$     |
| 13  | $11$               | $1\frac{1}{8}$ | $1\frac{1}{8}$    | $\frac{5}{8}$     |

Center ball can be drilled and faced any size desired.

| No. | Length<br>Over All | Center<br>Ball | End<br>Balls  |                     |
|-----|--------------------|----------------|---------------|---------------------|
| 1   | $2\frac{1}{2}$     | $1\frac{1}{8}$ | $\frac{3}{4}$ | No handle in ends   |
| 2   | $2\frac{1}{2}$     | $1\frac{1}{8}$ | $\frac{3}{4}$ | Handle in one end   |
| 3   | $2\frac{1}{2}$     | $1\frac{1}{8}$ | $\frac{3}{4}$ | Handle in both ends |
| 4   | $2\frac{1}{2}$     | $1\frac{1}{8}$ | $\frac{3}{4}$ | No handle in ends   |
| 5   | $2\frac{1}{2}$     | $1\frac{1}{8}$ | $\frac{3}{4}$ | Handle in one end   |
| 6   | $2\frac{1}{2}$     | $1\frac{1}{8}$ | $\frac{3}{4}$ | Handle in both ends |
| 7   | $2\frac{1}{2}$     | $1\frac{1}{8}$ | $\frac{3}{4}$ | No handle in ends   |
| 8   | $2\frac{1}{2}$     | $1\frac{1}{8}$ | $\frac{3}{4}$ | Handle in one end   |
| 9   | $2\frac{1}{2}$     | $1\frac{1}{8}$ | $\frac{3}{4}$ | Handle in both ends |
| 10  | $2\frac{1}{2}$     | $1\frac{1}{8}$ | $\frac{3}{4}$ | No handle in ends   |
| 11  | $2\frac{1}{2}$     | $1\frac{1}{8}$ | $\frac{3}{4}$ | Handle in one end   |
| 12  | $2\frac{1}{2}$     | $1\frac{1}{8}$ | $\frac{3}{4}$ | Handle in both ends |

Center ball can be drilled and faced any size desired.

**COMPOUND REST HANDLES****MACHINE HANDLES**

| No. | Length<br>of Shank | Length<br>Over All | Diameter<br>of Shank |
|-----|--------------------|--------------------|----------------------|
| 000 | $\frac{1}{2}$      | $1\frac{1}{8}$     | $\frac{1}{4}$        |
| 00  | $\frac{1}{2}$      | 2                  | $\frac{1}{4}$        |
| 0   | $\frac{1}{2}$      | $2\frac{1}{4}$     | $\frac{1}{8}$        |
| 1   | $\frac{1}{2}$      | $2\frac{3}{4}$     | $\frac{1}{8}$        |
| 2   | $\frac{1}{2}$      | $3\frac{1}{8}$     | $\frac{1}{8}$        |
| 3   | $\frac{1}{2}$      | $3\frac{1}{2}$     | $\frac{1}{8}$        |
| 4   | $\frac{1}{2}$      | $3\frac{3}{4}$     | $\frac{1}{8}$        |
| 5   | $\frac{1}{2}$      | $4\frac{1}{8}$     | $\frac{1}{8}$        |
| 6   | 1                  | $4\frac{5}{8}$     | $\frac{1}{8}$        |
| 7   | 1                  | $5\frac{1}{8}$     | $\frac{1}{8}$        |
| 8   | $1\frac{1}{4}$     | $5\frac{3}{4}$     | $\frac{1}{8}$        |

| No. | Length<br>Over All | Large<br>End Ball | Small<br>End Ball |
|-----|--------------------|-------------------|-------------------|
| 2   | $4\frac{1}{2}$     | $1\frac{1}{8}$    | $\frac{3}{8}$     |
| 4   | $5\frac{1}{2}$     | $1\frac{1}{8}$    | 1                 |
| 6   | $6\frac{1}{2}$     | $1\frac{1}{8}$    | 1                 |
| 8   | $7\frac{1}{2}$     | $1\frac{1}{8}$    | 1                 |
| 10  | $8\frac{1}{2}$     | $1\frac{1}{8}$    | $1\frac{1}{8}$    |
| 11  | 9                  | $1\frac{1}{8}$    | $1\frac{1}{8}$    |

Large ball can be drilled and faced any size desired.

**TWO BALL LEVERS**

Adapted for Tail Stock, Tighteners, Drill Press Clamps  
Back Gear Levers, and for all similar  
purposes.



Manufactured as a specialty and sold below the manufacturing cost of cast iron or forged handles. Estimates given on large screw machine work, handles and screws of every description.

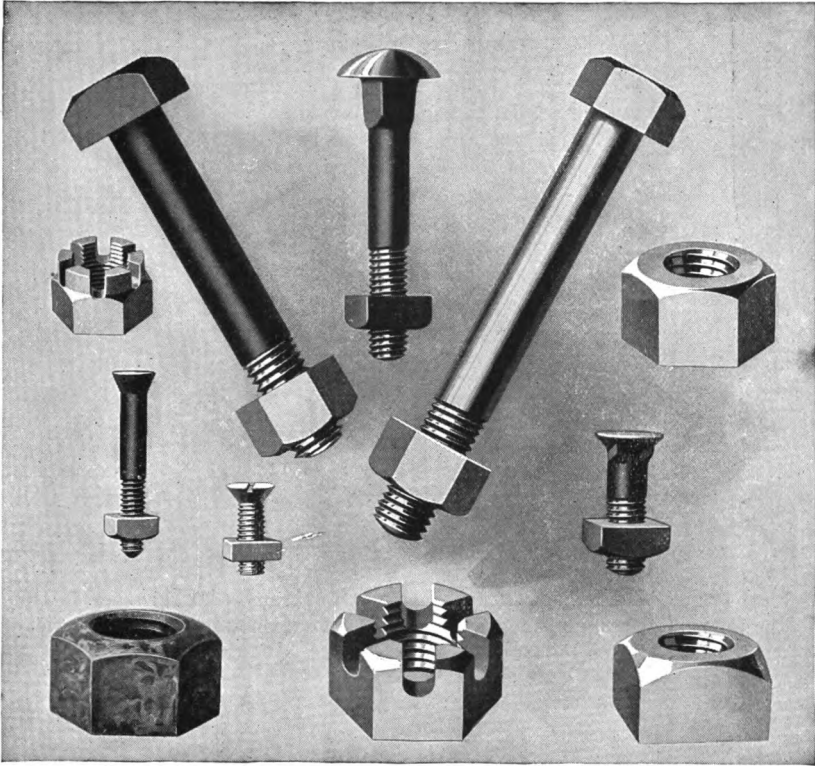
# **RUSSELL, BURDSALL AND WARD BOLT AND NUT COMPANY**

**PORT CHESTER, N. Y.**

**ROCK FALLS, ILL.**

## **BOLTS AND NUTS**

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### **Manufacturers of All kinds of**

**Carriage Bolts  
Machine Bolts  
Coupling Bolts  
Stud Bolts  
Tap Bolts  
Plow and Cultivator  
Bolts**

**Stove Bolts  
Tire Bolts  
Rivets and Special Bolts  
of all descriptions  
Cold Punched, Chamfered  
and Trimmed Hexa-  
gon and Square Nuts**

**A.L.A.M. Plain and Cas-  
telled Nuts  
Master Mechanics' Cas-  
tle Nuts  
Semi-finished, Full Fin-  
ished and Case Hard-  
ened Nuts**

**Our Trade Mark:**

**"EMPIRE"**

**signifies a certain standard of excellence that invites your investigation.**

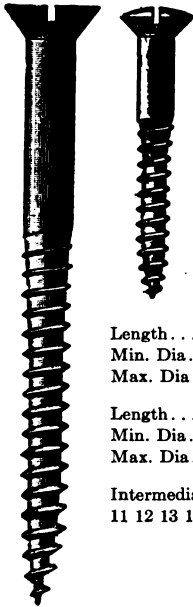
# AMERICAN SCREW COMPANY

PROVIDENCE, R. I.

MAKERS OF WOOD SCREWS, MACHINE SCREWS, STOVE BOLTS,  
TIRE BOLTS, RIVETS, ETC.

Flat Head Oval Head

Drive Screw Round Head



## WOOD SCREWS

Flat and Round Head Wood Screws are regularly made in Iron in the following sizes, and in Brass in sizes of approximately the same variety; other kinds of Wood Screws are made in the sizes commonly used.



|               |   |   |    |    |    |    |    |    |    |    |   |
|---------------|---|---|----|----|----|----|----|----|----|----|---|
| Length.....   | ¼ | ¾ | 1½ | 2  | 2½ | 3  | 3½ | 4  | 4½ | 5  | 6 |
| Min. Dia..... | 0 | 0 | 1  | 1  | 2  | 2  | 3  | 3  | 3  | 5  |   |
| Max. Dia..... | 4 | 9 | 12 | 14 | 16 | 16 | 20 | 24 | 24 | 24 |   |

|               |    |    |    |    |    |    |    |    |    |    |
|---------------|----|----|----|----|----|----|----|----|----|----|
| Length.....   | 2  | 2½ | 2½ | 2¾ | 3  | 3½ | 4  | 4½ | 5  | 6  |
| Min. Dia..... | 5  | 5  | 5  | 6  | 6  | 8  | 8  | 12 | 12 | 12 |
| Max. Dia..... | 24 | 24 | 24 | 24 | 26 | 26 | 30 | 30 | 30 | 30 |

Intermediate diameters advance as follows: No. 0 1 2 3 4 5 6 7 8 9 10  
11 12 13 14 15 16 17 18 20 22 24 26 28 30

## MACHINE SCREWS

Flat, Round, and Fillister Head Machine Screws are regularly made in Iron in the following sizes, and in Brass in sizes of approximately the same variety:

|              |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Length.....  | ½  | ¾  | 1  | 1½ | 2  | 2½ | 3  | 3½ | 4  | 4½ | 5  | 6  | 7  | 8  |
| Min. Dia.... | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 4  | 4  | 4  | 4  | 4  |
| Max. Dia.... | 10 | 14 | 16 | 24 | 24 | 24 | 24 | 24 | 34 | 34 | 34 | 34 | 34 | 34 |

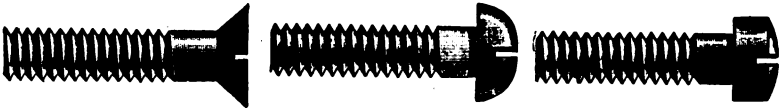
|              |    |    |    |    |    |    |    |    |    |    |
|--------------|----|----|----|----|----|----|----|----|----|----|
| Length.....  | 1½ | 2  | 2½ | 2½ | 2¾ | 3  | 3½ | 3½ | 3¾ | 4  |
| Min. Dia.... | 4  | 4  | 5  | 7  | 7  | 7  | 9  | 9  | 4  | 4  |
| Max. Dia.... | 34 | 34 | 34 | 34 | 30 | 30 | 30 | 30 | 30 | 30 |

Intermediate diameters advance as follows: No. 2 3 4 5 6 7 8 9 10 12 14 16 18 20 24 30 34

Flat Head

Round Head

Fillister Head



|                 |          |       |          |          |       |          |          |       |          |
|-----------------|----------|-------|----------|----------|-------|----------|----------|-------|----------|
| Diameter No.    | 2        | 3     | 4.5      | 6        | 7     | 8        | 9.10     | 12    | 14       |
| Threads per in. | 48.56.64 | 48.56 | 32.36.40 | 30.32.36 | 30.32 | 30.32.36 | 24.30.32 | 20.24 | 18.20.24 |
|                 | 16.18    | 20    | 24       | 30       | 34    |          |          |       |          |
|                 | 16.18.20 | 16.18 | 14.16.18 | 14.16    | 13    |          |          |       |          |

Regular Side Knob Screws  are ¾ inch No. 9, 24 thread.

# AMERICAN SCREW COMPANY

## STOVE BOLTS



Flat and Round Head Iron Stove Bolts are regularly made in the following sizes:

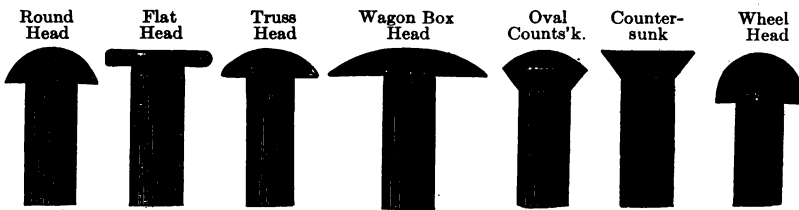
|                  |               |                |                |                |                |                |                |               |
|------------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------|
| Diameter.....    | $\frac{1}{8}$ | $\frac{3}{16}$ | $\frac{1}{4}$  | $\frac{5}{16}$ | $\frac{3}{8}$  | $\frac{7}{16}$ | $\frac{1}{2}$  | $\frac{5}{8}$ |
| Min. Length..... | $\frac{3}{8}$ | $\frac{3}{8}$  | $\frac{3}{8}$  | $\frac{1}{2}$  | $\frac{1}{2}$  | $\frac{3}{4}$  | $\frac{3}{4}$  | 1             |
| Max. Length..... | 2             | 2              | $6\frac{1}{2}$ | $6\frac{1}{2}$ | $6\frac{1}{2}$ | $6\frac{1}{2}$ | $6\frac{1}{2}$ | 3             |

The length advances by eighths of an inch from  $\frac{3}{8}$  to  $1\frac{1}{2}$ , then by quarters to  $6\frac{1}{2}$ .

## STOVE RODS

Stove Rods are the same as Stove Bolts in every respect excepting length. They are regularly made in Iron of  $\frac{3}{8}$  and  $\frac{1}{4}$  diameter in length from 7 to 40", advancing by halves of an inch.

## RIVETS



Cold-headed Rivets are made in great variety of styles and sizes up to  $\frac{1}{16}$  in diameter and 6 in length.

## MEASUREMENTS

The length includes the head of Flat Head Screws, Stove Bolts, and Stove Rods; excludes the head of Round and Fillister Head Machine Screws and Round Head Stove Bolts and Stove Rods; includes the countersink of Oval Head Screws and about half the head of Round Head Wood Screws, but the practice with regard to Round Head Wood Screws is not uniform with all makers.

The length of Rivets is exclusive of the head for all styles with a right angle under the head, and inclusive of the countersink for countersunk heads.

The diameter of Screws is measured by the American Screw Gauge, the equivalent in inches being:

|         |         |          |          |          |
|---------|---------|----------|----------|----------|
| 0 .0578 | 5 .1236 | 10 .1894 | 15 .2552 | 22 .3474 |
| 1 .0710 | 6 .1368 | 11 .2026 | 16 .2684 | 24 .3737 |
| 2 .0842 | 7 .1500 | 12 .2158 | 17 .2816 | 26 .4000 |
| 3 .0973 | 8 .1631 | 13 .2289 | 18 .2947 | 28 .4263 |
| 4 .1105 | 9 .1763 | 14 .2421 | 20 .3210 | 30 .4526 |
|         |         |          |          | 34 .5053 |

The diameter of Rivets is measured by the old Standard Birmingham Wire Gauge, the equivalent in inches being:

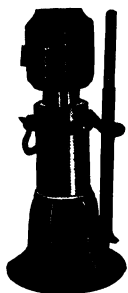
|          |        |        |         |         |
|----------|--------|--------|---------|---------|
| 000 .425 | 2 .284 | 6 .203 | 10 .134 | 14 .083 |
| 00 .380  | 3 .259 | 7 .180 | 11 .120 | 15 .072 |
| 0 .340   | 4 .238 | 8 .165 | 12 .109 | 16 .065 |
| 1 .300   | 5 .220 | 9 .148 | 13 .095 | 17 .058 |
|          |        |        |         | 18 .049 |

# THE JOYCE-CRIDLAND CO.

DAYTON, OHIO

**MANUFACTURERS OF ALL STYLES OF LIFTING JACKS: HYDRAULIC, LEVER, AUTOMATIC, GEARED AUTOMATIC, SCREW, TRAVERSING, JOURNAL, ETC.**

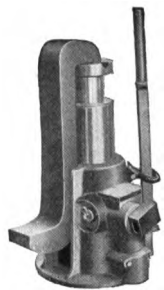
## HYDRAULIC JACKS



**Inside Pump Type**

"J-C" Hydraulic Jacks have a wide range in ratios of ram area to pump plunger area and large handle leverage, permitting one man to lift up to several hundred tons without severe exertion. Can be let down as slowly or as rapidly as desired. Cylinders and ram are forged from solid bar of steel, and sliding surfaces contain no welds or seams to impair contact. Special provision made for preventing leakage and undue wear—there is easy access to suction and discharge valves in pump block. All delicate surfaces are protected from grit. Jacks have safety stop to prevent ram being pumped beyond its limit.

Our Hydraulic Jacks are made in two types. The IN-SIDE PUMP type consists essentially of two telescoping hollow steel cylinders, the inner one furnishing the cistern and the recess for the pump. This type is very light and compact, and absolutely reliable under all loads up to rated capacity. In the OUTSIDE PUMP type, the pump occupies a fixed position at one side of the cylinder, and the operating lever always swings in a fixed center. This type is more suitable for heavy tonnages.



**Outside Pump Type**

| INSIDE PUMP TYPE |                |            |                     |                |  | OUTSIDE PUMP TYPE |                |            |                     |                |             |                |            |                     |                |
|------------------|----------------|------------|---------------------|----------------|--|-------------------|----------------|------------|---------------------|----------------|-------------|----------------|------------|---------------------|----------------|
| Jack No.         | Capacity, Tons | Rise, Ins. | Ht. when Down, Ins. | Weight, Pounds |  | Single Pump       |                |            |                     |                | Double Pump |                |            |                     |                |
|                  |                |            |                     |                |  | Jack No.          | Capacity, Tons | Rise, Ins. | Ht. when Down, Ins. | Weight, Pounds | Jack No.    | Capacity, Tons | Rise, Ins. | Ht. when Down, Ins. | Weight, Pounds |
| 412BB            | 4              | 12         | 23 1/8              | 60             |  | 3006OSP           | 30             | 6          | 13 3/4              | 184            | 3006ODP     | 30             | 6          | 13 3/4              | 184            |
| 418BB            | 4              | 18         | 29 7/8              | 68             |  | 3009OSP           | 30             | 9          | 16 3/4              | 204            | 3009ODP     | 30             | 9          | 16 3/4              | 204            |
| 424BB            | 4              | 24         | 35 7/8              | 74             |  | 3012OSP           | 30             | 12         | 20 1/4              | 241            | 3012ODP     | 30             | 12         | 20 1/4              | 241            |
| 709BB            | 7              | 9          | 21                  | 69             |  | 3018OSP           | 30             | 18         | 25 3/4              | 259            | 3018ODP     | 30             | 18         | 25 3/4              | 259            |
| 712BB            | 7              | 12         | 24                  | 75             |  | 3024OSP           | 30             | 24         | 31 3/4              | 304            | 3024ODP     | 30             | 24         | 31 3/4              | 304            |
| 718BB            | 7              | 18         | 29 5/8              | 81             |  | 4006OSP           | 40             | 6          | 14 1/4              | 200            | 4006ODP     | 40             | 6          | 14 1/4              | 200            |
| 724BB            | 7              | 24         | 36                  | 99             |  | 4009OSP           | 40             | 9          | 17 1/4              | 222            | 4009ODP     | 40             | 9          | 17 1/4              | 222            |
| 1006BB           | 10             | 6          | 19 5/8              | 89             |  | 4012OSP           | 40             | 12         | 20 1/4              | 244            | 4012ODP     | 40             | 12         | 20 1/4              | 244            |
| 1009BB           | 10             | 9          | 22 3/4              | 89             |  | 4018OSP           | 40             | 18         | 26 3/8              | 288            | 4018ODP     | 40             | 18         | 26 3/8              | 288            |
| 1012BB           | 10             | 12         | 25 3/4              | 97             |  | 4024OSP           | 40             | 24         | 32 3/8              | 332            | 4024ODP     | 40             | 24         | 32 3/8              | 332            |
| 1018BB           | 10             | 18         | 31 1/4              | 112            |  | 6009OSP           | 60             | 9          | 18 3/8              | 268            | 6009ODP     | 60             | 9          | 18 3/8              | 268            |
| 1024BB           | 10             | 24         | 37 3/4              | 128            |  | 6012OSP           | 60             | 12         | 20 3/4              | 313            | 6012ODP     | 60             | 12         | 20 3/4              | 313            |
| 1512BB           | 15             | 12         | 25 1/2              | 125            |  | 6018OSP           | 60             | 18         | 26 3/4              | 353            | 6018ODP     | 60             | 18         | 26 3/4              | 353            |
| 1518BB           | 15             | 18         | 32 3/4              | 137            |  | 8009OSP           | 80             | 9          | 18 1/2              | 357            | 8009ODP     | 80             | 9          | 18 1/2              | 357            |
| 1524BB           | 15             | 24         | 38 7/8              | 163            |  | 8012OSP           | 80             | 12         | 21                  | 394            | 8012ODP     | 80             | 12         | 21                  | 394            |
| 2012BB           | 20             | 12         | 25 3/8              | 129            |  | 8018OSP           | 80             | 18         | 27 1/2              | 469            | 8018ODP     | 80             | 18         | 27 1/2              | 469            |
| 2018BB           | 20             | 18         | 33                  | 161            |  | 10009OSP          | 100            | 9          | 19 1/4              | 450            | 10009ODP    | 100            | 9          | 19 1/4              | 450            |
| 2024BB           | 20             | 24         | 38 5/8              | 181            |  | 10012OSP          | 100            | 12         | 22 1/4              | 495            | 10012ODP    | 100            | 12         | 22 1/4              | 495            |
| 3009BB           | 30             | 9          | 24 1/4              | 189            |  | 10018OSP          | 100            | 18         | 29 3/4              | 596            | 10018ODP    | 100            | 18         | 29 3/4              | 596            |
| 3012BB           | 30             | 12         | 26 3/4              | 205            |  | 15009OSP          | 150            | 9          | 20                  | 500            | 15009ODP    | 150            | 9          | 20                  | 500            |
| 3018BB           | 30             | 18         | 33 3/8              | 230            |  | 15012OSP          | 150            | 12         | 23                  | 550            | 15012ODP    | 150            | 12         | 23                  | 550            |
| 3024BB           | 30             | 24         | 39 3/8              | 265            |  | 15018OSP          | 150            | 18         | 30 5/8              | 750            | 15018ODP    | 150            | 18         | 30 5/8              | 750            |
| 4009BB           | 40             | 9          | 24 3/8              | 191            |  | 20012OSP          | 200            | 12         | 25                  | 750            | 20012ODP    | 200            | 12         | 25                  | 750            |
| 4012BB           | 40             | 12         | 27 3/8              | 214            |  |                   |                |            |                     |                |             |                |            |                     |                |
| 4018BB           | 40             | 18         | 33 3/8              | 249            |  |                   |                |            |                     |                |             |                |            |                     |                |
| 4024BB           | 40             | 24         | 40                  | 294            |  |                   |                |            |                     |                |             |                |            |                     |                |
| 6009BB           | 60             | 9          | 24                  | 228            |  |                   |                |            |                     |                |             |                |            |                     |                |
| 6012BB           | 60             | 12         | 27                  | 240            |  |                   |                |            |                     |                |             |                |            |                     |                |
| 6018BB           | 60             | 18         | 33                  | 264            |  |                   |                |            |                     |                |             |                |            |                     |                |

## TRAVERSING JACKS

These are our regular screw jacks with bottoms of special design and fitted to traversing bases. The main parts are of malleable iron and the screws of machinery steel.



|                           |       |       |       |       |       |        |       |       |
|---------------------------|-------|-------|-------|-------|-------|--------|-------|-------|
| Jack No.                  | 37    | 37a   | 63    | 60a   | 35    | 41     | 36    | 42    |
| Height when Down, Ins.    | 15    | 15    | 18    | 18    | 27    | 30 1/2 | 23    | 26    |
| Height of Base, Ins.      | 3 1/2 | 3 1/2 | 3 1/2 | 3 1/2 | 4 3/4 | 3 1/4  | 3 1/4 | 4 3/4 |
| Rise of Screw, Ins.       | 10    | 10    | 14    | 14    | 10    | 11     | 10    | 12    |
| Horizontal Movement, Ins. | 15    | 15    | 15    | 15    | 15    | 15     | 15    | 15    |
| Weight of Jack, Pounds    | 137   | 115   | 149   | 135   | 172   | 300    | 143   | 280   |
| Capacity, Tons            | 8     | 8     | 15    | 15    | 25    | 50     | 25    | 50    |

# THE JOYCE-CRIDLAND CO.

## PLAIN LEVER JACKS

These Jacks are especially suited for small and medium loads where the jack must be applied in various different ways, and under rugged conditions.

| Jack No. | Height when Down, Ins. | Rise of Bar, Ins. | Size of Bar, Ins. (Square) | Weight of Jack, Pounds | Capacity, Tons |
|----------|------------------------|-------------------|----------------------------|------------------------|----------------|
| 1a       | 16                     | 8½                | 1½                         | 24                     | 2              |
| 2a       | 18½                    | 10                | 1½                         | 28                     | 2              |
| 3        | 11½                    | 4                 | 1½                         | 27                     | 4              |
| 4        | 22½                    | 14                | 1½                         | 40                     | 4              |
| 4a       | 18½                    | 10½               | 1½                         | 37                     | 4              |
| 4e       | 41½                    | 35                | 1½                         | 60                     | 4              |
| 4f       | 36                     | 30                | 1½                         | 55                     | 4              |
| 6        | 26½                    | 14                | 2                          | 92                     | 15             |
| 7        | 35                     | 25½               | 2                          | 115                    | 15             |
| 10       | 27                     | 16                | 1½                         | 76                     | 10             |
| 10a      | 22½                    | 11½               | 1½                         | 63                     | 10             |



Plain Lever Jack

## FULL AUTOMATIC LEVER AND GEARED JACKS

Full Automatic Lever Jacks are full automatic in raising and lowering, action being controlled by reversing lever on outside of frame. They are composed of few working parts and are more powerful than any type of plain lever jacks.

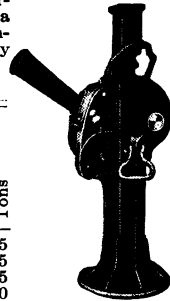
In the Full Automatic Geared Jacks, by means of a gear and pinion, interposed between the lever and lifting bar, one can lift with the same effort a weight four times as great as with a plain lever jack. This jack is of the simplest possible construction considering its full automatic features. For heavy service and severe usage.

### AUTOMATIC LEVER JACKS

| Jack No. | Ht. of Bar, Down, Ins. | Rise of Bar, Ins. | Size of Bar, Ins. (Sq.) | Weight, Pounds | Capacity, Tons |
|----------|------------------------|-------------------|-------------------------|----------------|----------------|
| 66       | 13½                    | 6½                | 1½                      | 33             | 4              |
| 67       | 16                     | 8                 | 1½                      | 34             | 4              |
| 68       | 19                     | 11                | 1½                      | 39             | 4              |
| *74      | 11                     | 5                 | 1½                      | 35             | 10             |
| 76       | 22½                    | 14½               | 1½                      | 54             | 10             |
| 80       | 22                     | 10                | 1½                      | 80             | 12             |
| 81       | 27                     | 15                | 1½                      | 88             | 12             |
| 84       | 22                     | 12                | 2                       | 90             | 15             |
| 85       | 26½                    | 16                | 2                       | 105            | 15             |
| 86       | 36                     | 25                | 2                       | 128            | 15             |

### AUTOMATIC GEARED JACKS

| Jack No. | Ht. when Down, Ins. | Rise of Bar, Ins. | Rise per Str. of Lever, Ins. | Size of Bar, Ins. | Weight, Pounds | Capacity, Tons |
|----------|---------------------|-------------------|------------------------------|-------------------|----------------|----------------|
| 293      | 24                  | 14                | ½                            | 2½x3              | 175            | 35             |
| 295      | 27                  | 17                | ½                            | 2½x3              | 190            | 35             |
| 296      | 33                  | 23                | ½                            | 2½x3              | 215            | 35             |
| 397      | 22                  | 12                | ½                            | 3x3               | 250            | 50             |
| 398      | 24                  | 14                | ½                            | 3x3               | 260            | 50             |
| 399      | 25½                 | 15½               | ½                            | 3x3               | 265            | 50             |
| 400      | 27½                 | 17                | ½                            | 3x3               | 268            | 50             |
| 401      | 36                  | 26                | ½                            | 3x3               | 300            | 50             |
| 402      | 31                  | 21                | ½                            | 3x3               | 282            | 50             |



Full Automatic Geared Jack

\*This jack is shortened for journal box work.

## GEARED SCREW JACKS

The "J-C" Geared Screw Jack gives the greatest speed consistent with safety. Entire working parts can be removed through top of jack without taking sleeve off standard. Nut is locked, preventing it being pulled out while jack is being carried or handled, and has a positive stop which prevents screw from being run out of nut.

| Jack No. | Ht. when Down, Ins. | Rise of Screw, Ins. | Diam. of Screw, Ins. | Weight, Pounds | Capacity, Tons |
|----------|---------------------|---------------------|----------------------|----------------|----------------|
| 154RB    | 22                  | 13                  | 2                    | 114            | 25             |
| 154SB    | "                   | "                   | "                    | 114            | "              |
| 154GL    | "                   | "                   | "                    | 119            | "              |
| 155RB    | 26                  | 17                  | 2                    | 128            | 25             |
| 155SB    | "                   | "                   | "                    | 128            | "              |
| 155GL    | "                   | "                   | "                    | 133            | "              |
| 156RB    | 34                  | 25                  | 2                    | 157            | 25             |
| 156SB    | "                   | "                   | "                    | 157            | "              |
| 156GL    | "                   | "                   | "                    | 162            | "              |
| 157RB    | 20                  | 11                  | 2½                   | 161            | 35             |
| 157SB    | "                   | "                   | "                    | 161            | "              |
| 157GL    | "                   | "                   | "                    | 168            | "              |
| 158RB    | 22                  | 13                  | 2½                   | 172            | 35             |
| 158SB    | "                   | "                   | "                    | 172            | "              |
| 158GL    | "                   | "                   | "                    | 180            | "              |
| 159RB    | 24                  | 15                  | 2½                   | 183            | 35             |
| 159SB    | "                   | "                   | "                    | 183            | "              |
| 159GL    | "                   | "                   | "                    | 191            | "              |
| 160RB    | 27                  | 18                  | 2½                   | 200            | 35             |
| 160SB    | "                   | "                   | "                    | 200            | "              |
| 160GL    | "                   | "                   | "                    | 208            | "              |

| Jack No. | Ht. when Down, Ins. | Rise of Screw, Ins. | Diam. of Screw, Ins. | Weight, Pounds | Capacity, Tons |
|----------|---------------------|---------------------|----------------------|----------------|----------------|
| 161RB    | 30                  | 21                  | 2½                   | 217            | 35             |
| 161SB    | "                   | "                   | "                    | 217            | "              |
| 161GL    | "                   | "                   | "                    | 225            | "              |
| 162RB    | 33                  | 24                  | 2½                   | 234            | 35             |
| 162SB    | "                   | "                   | "                    | 234            | "              |
| 162GL    | "                   | "                   | "                    | 242            | "              |
| 164RB    | 24                  | 13½                 | 2¾                   | 220            | 50             |
| 164SB    | "                   | "                   | "                    | 220            | "              |
| 164GL    | "                   | "                   | "                    | 230            | "              |
| 165RB    | 27½                 | 17                  | 2¾                   | 243            | 50             |
| 165SB    | "                   | "                   | "                    | 243            | "              |
| 165GL    | "                   | "                   | "                    | 253            | "              |
| 166RB    | 31                  | 21                  | 2¾                   | 267            | 50             |
| 166SB    | "                   | "                   | "                    | 267            | "              |
| 166GL    | "                   | "                   | "                    | 277            | "              |
| 168RB    | 38                  | 28                  | 2¾                   | 314            | 50             |
| 170RB    | 27                  | 14½                 | 3                    | 288            | 70             |
| 170SB    | "                   | "                   | "                    | 288            | "              |
| 170GL    | "                   | "                   | "                    | 300            | "              |



Geared Screw Jack, Square Base with Ground Lift

## OXWELD ACETYLENE CO.

CHICAGO, ILL.

NEWARK, N. J.

LOS ANGELES, CAL.

**MANUFACTURERS OF OXY-ACETYLENE APPARATUS FOR WELDING  
AND CUTTING METALS**

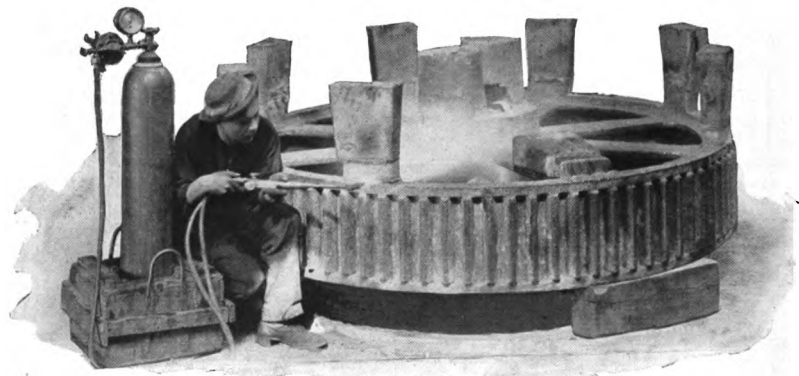
### THE OXWELD PROCESS OF WELDING AND CUTTING

With this process, in welding, oxygen and acetylene are used to produce a small flame, developing a degree of heat far greater than that produced by other gases or solid fuels.

A weld in iron and steel plate and castings, and other metals, is made by applying this flame to the edges of the parts to be joined. As the metal is reduced to a molten state fused wire is added, producing an actual "fusion" weld.

An infinite number of operations are made possible by this method of joining iron and steel and of adding metal at will to any piece of work. The fields in which the process is of value are therefore practically unlimited, and operations hitherto unthought of are being constantly carried out.

The process is also extensively used in cutting wrought-iron and steel plates, structural steel-work and steel castings. This application is based on the fact that a jet of oxygen directed upon a previously heated spot of metal ignites it and the metal burns (oxidizes) with great rapidity. A narrow, clean slot, cut through the section, is the result. This action proceeds too rapidly for the heat to spread, and the metal on each side of the cut is neither melted nor injured in any way. The edges practically present the clean metallic surface of a saw-cut.



**Cutting Risers from Machine-Moulded Gear**

The OXWELD PROCESS has so revolutionized engineering methods in many branches of the metal industry that it is now recognized as an indispensable part of the equipment of every modern plant.

The OXWELD PROCESS is adapted to and extensively used in *iron and steel foundries, manufacturing plants, locomotive repair shops, railroad car shops, ship yards, machine shops, boiler shops, contractors' repair shops, heavy steel construction work, steel mills, steel stamping mills, tank manufacturing plants, smelters and mining plants, automobile repair shops, aluminum foundries, etc.*

We maintain at our works in Chicago and Newark extensive schools of welding and laboratories in which operators are taught to weld, and where experimental work is carried on. Specimen parts will be welded at our shops and returned for inspection and test. *Complete plants installed under our direction anywhere.*



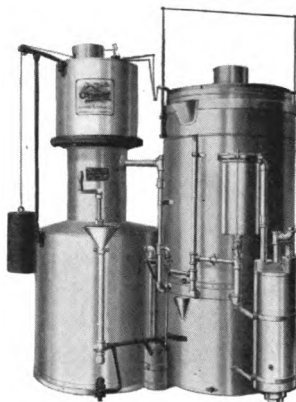
## OXWELD ACETYLENE CO.

### OXWELD GENERATORS

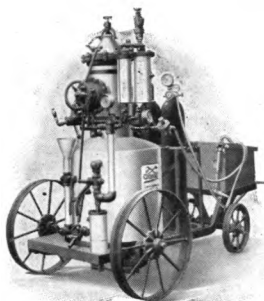
The Oxweld Low-Pressure Generator consists of two parts, one containing the carbide holder and generating chamber,—the other the seal chamber and gas bell or gasometer.

The carbide feeding mechanism secures its power from a simple and reliable weight motor, giving a positive force feed, which assures automatic and reliable operation under all conditions of use. The weight of the gasometer maintains the gas at a uniform pressure. There are no intricate parts which may get out of order or which are subject to wear, and every part is readily accessible. It is extremely simple in construction and requires no attention except recharging.

The Oxweld Low-Pressure Duplex Generator consists of two acetylene generators and one gasometer. With this type, each generator can be operated independently of the other, allowing one to be used while the other is being recharged.



Low Pressure Generator



Portable Pressure Welding Plant

In complete installations the acetylene generator is usually located in a separate room or building. Oxygen tanks with the necessary regulators are placed conveniently near to where welding or cutting is being done.

**Oxweld Pressure Welding Plant:** The acetylene generator may be mounted on a truck, or it may be located in a stationary position. It consists of a single shell which contains both the carbide hopper and the generator tank. For portable and other uses for which high pressure acetylene is desirable, this generator will be found very convenient and efficient. The construction throughout is of the same substantial character as that of the Oxweld low-pressure generator.

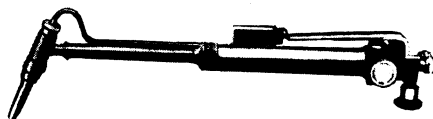
### OXWELD BLOWPIPES AND CUTTERS

The Oxweld Blowpipe for Welding is designed for use with either high or low pressure acetylene, and is constructed on the injector principle. Furnished with ten interchangeable welding heads and copper tips and four sizes of blowpipe handles, for use with metals of various thicknesses. Its controlling valves enable the operator to quickly and accurately adjust the flame for all conditions and operations.



Blow Pipe for Welding

The Oxweld Cutting Blowpipe is also constructed on the injector principle, and is designed for cutting only. External cutting nozzles are uniform in size. Internal cutting nozzles are supplied in three sizes: No. 1 for cutting various thicknesses of metal up to 3 inches, No. 2 for cutting from 3 to 6 inches, and No. 3 for cutting from 6 to 9 inches. All Oxweld cutting nozzles are interchangeable.



Cutting Blow Pipe

## AMERICAN GAS FURNACE CO.

24 JOHN STREET, NEW YORK

**GAS ENGINEERS AND MANUFACTURERS: FUEL GAS PLANTS; GAS BLAST FURNACES; PRESSURE BLOWERS; HEATING MACHINES; CASE HARDENING MACHINES; AUTOMATIC HEAT CONTROLLERS**

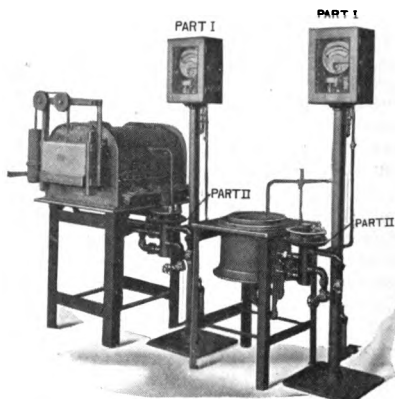
### GAS BLAST FURNACES

For practically all mechanical heating processes requiring accuracy in the use of heat.

### HEATING MACHINES

For hardening, tempering and annealing in quantities with perfect uniformity of results.

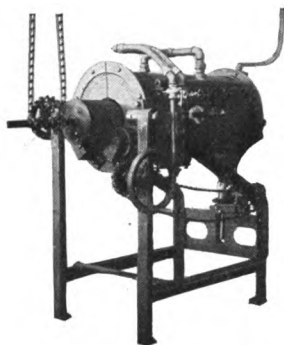
These machines are Gas Blast Furnaces arranged with carrying or propelling devices for the automatic transmission of work through heated space.



Automatic Heat Controller Applied to Oven Furnace for Hardening or Annealing and One Lead Hardening Furnace

### AUTOMATIC HEAT CONTROLLERS

Secure application of heat in furnaces and heating machines with no greater variation than five degrees Fahrenheit from ascertained standard of exact heat requirements. Consist of a Pyrometer that not only indicates but controls the temperature and a Pneumatic Valve for admitting both gas and air in the correct proportion required to produce and maintain the heat wanted.



No. 1 Case Hardening Machine  
Front View

### CASE HARDENING MACHINES

In these machines, gas takes the place of solid carbon, securing greater uniformity of Carbonizing than is possible when work is packed in solid carbons. The process of Carbonizing is also performed more quickly and at less cost. Every piece included in a charge is subjected to the same treatment, thus removing uncertainty with reference to depth of penetration.

*Pioneers in Gas Furnace Construction.*

# **THE COLONIAL STEEL COMPANY**

**PITTSBURGH, PENNSYLVANIA**

**HIGH GRADE STEEL**

## **COLONIAL HIGH SPEED STEEL**

Adapted for the heaviest cuts or the highest speeds on all classes of material. Colonial High Speed Steel is made in one grade only and is capable of doing any class of work for which high speed steel is suited.

## **COLONIAL NO. 7 TOOL STEEL, WATER HARDENING**

A vanadium tool steel of great strength and toughness; made from pure wrought iron, and suitable for high-class tools of all kinds, especially those subject to strain or stress or any kind through repeated action or repeated shock.

## **COLONIAL SPECIAL TOOL STEEL, WATER HARDENING**

A straight carbon tool steel, made from pure melting iron. Suitable for shop tools of all kinds.

## **RED STAR TOOL STEEL**

Standard grade for ordinary purposes.

## **RED STAR DRILL STEEL**

Hollow and Solid Steel for Rock Drilling.

## **NICKEL STEEL—CHROME VANADIUM STEEL**

Bars and Sheets made in small furnaces and carefully melted to insure homogeneous steel. Furnished free from pipes, seams and all defects.

## **30 PER CENT NICKEL STEEL**

**Bars and Sheets**

Anti-corrosive. Used for valve stems and parts of internal combustion engines, or other purposes where material is desired that will not rust or corrode.

## **SHEET STEEL**

For knives and tools of all kinds, springs, agricultural implements, etc.

## **SOFT CENTER PLOW STEEL**

Made in slabs or sheared to pattern, carefully manufactured, and special attention given to the toughness of center, and rigidly inspected.

## **FIVE PLY JAIL BARS AND SAFE PLATES**

Tool proof bars and plates for jail and vault construction.

## **WELL BIT AND JAR STEEL**

For tools for drilling oil, gas or water wells

## **HALCOMB STEEL COMPANY**

**SYRACUSE, N. Y.**

### **BRANCHES, AGENCIES AND STOCKS:**

Halcomb Steel Co., Syracuse, N. Y.

Halcomb Steel Co., Cleveland, O.

Halcomb Steel Co., Philadelphia, Pa.

Halcomb Steel Co., Chicago, Ill.

Hawkrigde Bros. Co., Agents, Boston, Mass.

**HIGH SPEED STEEL, TOOL STEEL, SHEET STEEL, DRILL RODS, FINE WIRE, COLD DRAWN STEEL AND SPECIAL STEELS OF ALL KINDS. FORGINGS, HEAT-TREATED TO EXACT SPECIFICATIONS.**

### **HALCOMB DREADNOUGHT HIGH SPEED STEEL**

This steel is unsurpassed by any product, foreign or domestic, where the most severe duty is demanded, as in heavy lathe and planer work, boring tools, turning glazed tires, alloy steel gears, flat and twisted drills. It is noted for consistent uniformity of analysis, and does not require fussy treatment.

The risk of breaking in hardening is minimized and tools cannot be ruined by over-heating. This steel is also readily annealed for machining. Cutters and fragile tools do not require a sweating heat when made from Dreadnought. They retain an excellent cutting edge, and hence show high efficiency for both roughing and finishing work. Write for "The Launching of Dreadnought."

### **HALCOMB KETOS OIL HARDENING TOOL STEEL**

The greatest achievement in tool steel since the discovery of high speed steel. There is a place for this steel in every shop and tool room. This steel neither expands, contracts nor warps in hardening. Safest steel ever produced from which to manufacture intricate tools, dies, cutters, etc. Think of making a twenty-two inch tap with no change in pitch after hardening! Write for special booklet on Ketos.

### **HALCOMB SPECIAL TOOL STEEL**

This steel is made in six tempers (varying from high to low carbon), to meet all tool steel requirements.

For turning, planing, and slotting hard materials, for expensive cutters, drills, forming tools, taps, reamers, punches, dies, etc.

Particularly recommended for all kinds of tools where special endurance is sought and where great strength and toughness are required.

### **HALCOMB EXTRA WARRANTED TOOL STEEL**

This steel is made in six tempers to meet varied requirements, and is of fine quality, suitable for many kinds of tools, including wood-working bits and knives, cold chisels, drills, mining drills, granite tools, lathe and planer tools, cutters, taps, reamers, dies, shear blades, punches, etc. An excellent steel for general use.

### **OTHER TOOL STEELS**

Other well-known brands of tool steels manufactured by this company are:

"Air Hardening Tool Steel"

"Double Special Tool Steel"

"Peerless Tool Steel"

"Extra Special Tool Steel"

"Permanent Magnet Steel"

"Standard Tool Steel"

Catalogues on request

## **HALCOMB STEEL COMPANY**

### **PIONEER AMERICAN MAKERS OF ELECTRIC FURNACE ALLOY STEELS**

These steels are chemically pure and especially free from sulphur, phosphorus and gases. They are completely deoxidized, thoroughly melted, homogeneous, and free from segregation, seams, and surface defects. They are easy to machine and respond with certainty to any definite heat treatment. They are very readily drop forged, and are not apt to be injured by over-heating.

Electric Furnace alloy steels have wide hardening ranges, so that uniform results can be had in plants not equipped with the latest devices for controlling temperatures. In resistance to fatigue they stand from 50% to 100% better than corresponding compositions made by other processes.

We make a specialty of Alloy Spring Steels, which are characterized by greater strength and fatigue values than ordinary spring steels. They thus permit of greater fibre stresses without sacrificing present factors of safety, and consequently make possible substantial reductions in weight.

These alloy steels are especially well suited for the construction of machine tool and automobile parts.

### **ELECTRIC NICKEL STEEL**

Nickel Steel is perhaps the most generally useful of the alloys. In various conditions of thermal treatment, it displays wonderfully good qualities, and is well suited to the production of structural parts. It case-hardens well, and in machining qualities is superior to the usual alloy steels.

### **CHROME VANADIUM STEELS**

The manufacture of genuine Crucible or Electric Chrome Vanadium Steels constitutes the highest attainment of the steel makers' art. By the proper blending of these alloying metals and adjustment of the carbon, we not only obtain every static property that can be obtained from Nickel, Chrome Nickel, Silico-Manganese or other alloys, but also obtain wonderfully enhanced dynamic or antifatigue qualities.

In general, when a better material than Nickel Steel is needed, we unreservedly commend our Chrome Vanadium Steels.

### **OTHER ELECTRIC FURNACE ALLOY STEELS**

The Halcomb Steel Company also manufacture Chrome-Nickel Steel, Chrome-Silicon Steel, Silico-Manganese Steel, and other alloys to meet special requirements.

### **COLD DRAWN AND COLD ROLLED STEEL**

We are prepared to furnish cold drawn steel from .007 in. to 3 in. diameter in rounds and corresponding sizes in squares, flats and special shapes, exact to size.

### **HEAT TREATING AND ANNEALING**

We are prepared to furnish any of our products, either tool or alloy steels, hammered or rolled, in the form of billets, bars or forgings, and unannealed, annealed or oil-tempered. Our heat-treating facilities are unexcelled, thoroughly modern and up-to-date in every way and under competent technical supervision. We act in an advisory capacity for our customers in reference to all matters pertaining to heat-treatment and heat-treating equipment, pyrometers, etc.

## UNION DRAWN STEEL COMPANY

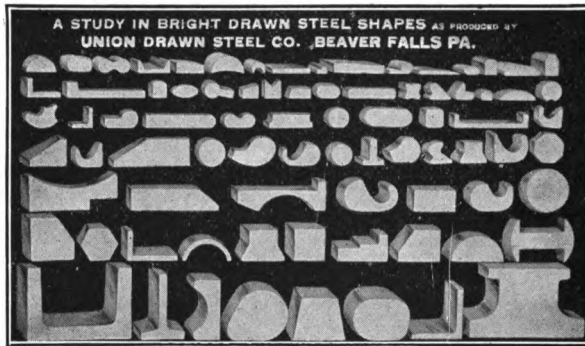
Works and General Office

BEAVER FALLS, PA.

WAREHOUSES: NEW YORK, PHILADELPHIA, CHICAGO, CINCINNATI.

BRANCH SALES OFFICES: BOSTON, BUFFALO, ATLANTA.

**MANUFACTURER OF BRIGHT FINISHED STEEL EXCLUSIVELY IN ROUNDS, SQUARES, HEXAGONS, FLATS AND SHAPES, SHAFTING, SCREW STEEL, AXLE STEEL, BESSEMER, OPEN HEARTH, CRUCIBLE, NICKEL AND VANADIUMS, DRAWN—COLD ROLLED AND TURNED STEEL.**



**SPECIAL SHAPES OF COLD DRAWN STEEL** of any dimensions within our range and for all purposes, will be made in the shortest possible time consistent with perfection in quality, in accordance with specifications furnished, where sufficient quantity will justify equipment.

The most comprehensive stock of Bright and Finished Steel, Rounds, Squares, Hexagons and Flats carried at our branch warehouses, in addition to the large stock we carry at our mill.

We are the largest manufacturers of cold finished steel and iron for shafting and various machinery uses.

Established 1889, but rebuilt Fireproof Plant and all new machinery installed, 1911.

**SHAFTING.**—We use only the best quality of soft steel and are manufacturing under recent patents, covering machinery and appliances, by a process superior to anything known for producing work mathematically accurate as to size, absolute straightness, and a perfectly polished surface.

**PISTON AND PUMP RODS.**—For piston and pump rods we use a special grade of steel, and can produce them strictly uniform in size and quality, highly polished, perfectly straight, and of lengths up to 60 or 70 feet.

**SCREW STEEL.**—For this work we furnish a special analysis of steel, which, after years of experiment, has proved best adapted to free cutting and threading, and for the production of the maximum number of parts in the minimum of time, by the use of automatic and hand screw machines and Turret lathes.

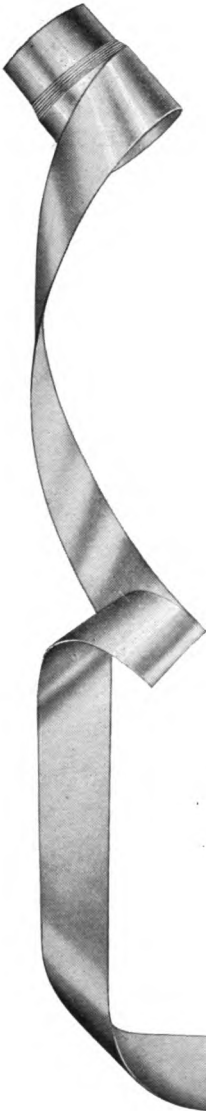
**SPECIAL STEEL.**—For the various places where special grades of steel are required, our experience and facilities are such that we can promptly furnish material best adapted for the special requirements.

## EDGAR T. WARD'S SONS

25 PURCHASE ST., BOSTON, MASS.

**COLD ROLLED STRIPS, BARS, SHEETS AND TUBES, TOOL STEELS,  
FINE STEEL WIRES**

### HARDENED, TEMPERED, POLISHED AND BLUED STEEL STRIPS



Our tempered stock is the finest Swedish Steel exact to thickness and width, nicely blued (except marked † Bright), and of an excellent even temper. No other stock can be relied upon for such uniformity of temper and accuracy to gauge.

Please order by thousandths of an inch.

#### In Stock

250 sizes  $\frac{1}{16}$ " to  $9\frac{1}{2}$ " wide, .0015 to .062 thick.

#### COLD ROLLED TOOL STEELS ANNEALED

We carry in stock cold rolled tool steel, bright annealed (free from Scale) for small cutters, saws, springs, etc.

$2'' \times .001''$  and  $.002''$   
 $3\frac{1}{4}'' \times .003''$ ,  $.004''$ ,  $.005''$  } In coils  
 $4'' \times .006''$  to  $.057''$   
 $5\frac{1}{2}'' \times .058''$ , .060, .0625, .065, .070, .072, .075, .077,  
 .083, .095, .101, .106, .109, .115, .120, .125, .134, .158  
 in 6 ft. lengths.

Hard Rolled .005" to .051" in coils  $3\frac{1}{8}''$  wide.

**Steel for Band, Butcher and Hack Saws; Steel Pens and Tapes.**

**Soft Bright Cold Rolled Strip Steel.**

Dead Soft to bend both ways of grain.

For stamping, deep drawing, shims, washers, machine parts, etc.

.012" to .312" thick widths to 12".

Sq. Edge Flats,  $\frac{3}{16}'' \times \frac{1}{8}''$  to  $3'' \times 2''$ .

Round Edge Flats  $\frac{1}{8}'' \times .062''$  to  $1'' \times .125$ .

Flat Square Edge Cold Drawn Tool Steel  $\frac{1}{8}'' \times \frac{1}{16}''$  to  $\frac{5}{8}'' \times \frac{3}{8}''$ .

Steel Tubes,  $\frac{1}{8}''$  diameter to 14". 1600 Sizes.

**Capital High Speed Tool Steel.**

**Dannemora Carbon Tool Steel.**

*128 Page Catalog on Application.*

# ALUMINUM COMPANY OF AMERICA

PITTSBURGH, PA.

## BRANCH OFFICES

NEW YORK, 99 John Street

BOSTON, MASS., 131 State Street

PITTSBURGH, PA., 2420 Oliver Bldg.

CLEVELAND, OHIO, 950 Leader-News Bldg.

CHICAGO, ILL., 1500 Westminster Bldg.

DETROIT, MICH., 1512 Ford Bldg.

TORONTO, ONT., NORTHERN ALUMINUM CO., LTD., 1503 Traders Bank Bldg.

PIERSON, ROEDING & COMPANY, 118 New Montgomery St., SAN FRANCISCO, CAL.

ROCHESTER, N. Y., 1112 Granite Bldg.

PHILADELPHIA, PA., 1315 Pennsylvania Building

KANSAS CITY, MO., 401 R. A. Long Bldg.

WASHINGTON, D. C., 512-513 National Metropolitan Bank Bldg.

## ALUMINUM

INGOT, CASTING ALLOYS, SHEET, ROD, WIRE, TUBING, MOULDINGS, FITTINGS, ELECTRICAL CONDUCTORS, BRONZE POWDER AND LITHOGRAPH PLATES.

## FABRICATED ALUMINUM

Steam jacketed kettles, tanks of all sizes and descriptions, pans, coils, pipe lines and miscellaneous apparatus for chemical, fruit juice and other manufacturers.

## ELECTRICAL CONDUCTORS

The use of Aluminum for electrical conductors has continually increased during the past five or six years. Its properties make its use desirable in electrical construction and it is now being successfully used for High Tension Transmission Wire, Railway Feeders, Bus-Bars, etc.

## Publications

The following publications issued by us contain much valuable information for the aluminum user and will be gladly sent to those interested:

PROPERTIES OF ALUMINUM

ALLOYS OF ALUMINUM

METHODS OF WORKING ALUMINUM

FABRICATED ALUMINUM

ALUMINUM FOR ELECTRICAL CONDUCTORS

INSTRUCTIONS FOR INSTALLATION AND MAINTENANCE OF ALUMINUM ELECTRICAL CONDUCTORS

ALUMINUM—ITS USE IN THE BREWERY

STEAM JACKETED KETTLES

USEFUL TABLES



# **THE AMERICAN BRASS COMPANY**

**WATERBURY, CONNECTICUT, U. S. A.**

## **MILLS AND FACTORIES:**

ANSONIA BRASS AND COPPER BRANCH, ANSONIA, CONN.  
BENEDICT AND BURNHAM BRANCH, WATERBURY, CONN.  
COE BRASS BRANCH, - - - - - TORRINGTON, CONN.  
COE BRASS BRANCH, - - - - - ANSONIA, CONN.  
KENOSHA BRANCH, - - - - - KENOSHA, WIS.  
WATERBURY BRASS BRANCH, - - - - - WATERBURY, CONN.

---

## **BRASS, COPPER AND GERMAN SILVER**

IN EVERY VARIETY OF SHEETS, ROLLS, PLATES, WIRE AND RODS, MOULDINGS,  
ANGLES AND CHANNELS, CIRCLES, BLANKS AND SHELLS

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## **SEAMLESS AND BRAZED TUBING**

CONDENSER TUBES AND LOCOMOTIVE TUBES

---

## **TOBIN BRONZE AND PHOSPHOR BRONZE**

RODS, PLATES AND SEAMLESS TUBING

---

## **EXTRUDED METAL**

RODS, SPECIAL SHAPES AND PRESSED METAL PARTS

---

## **TURBINE BLADING AND CALKING STRIPS**

OF BRASS OR CUPRO NICKEL

---

## **BENEDICT NICKEL WHITE METAL**

SEAMLESS TUBING, SHEETS, WIRE, RODS AND INGOT

---

## **BARE AND INSULATED COPPER WIRE AND CABLES**

"K. K." WEATHERPROOF AND SLOW BURNING WIRE, ROUND AND FLAT  
MAGNET WIRE

# THE BAYONNE CASTING COMPANY

GENERAL OFFICES AND WORKS, BAYONNE, N. J.

**MONEL METAL; BRASS, BRONZE, ALLOYS**

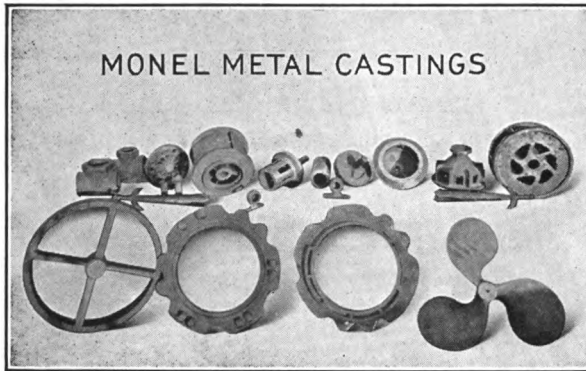
## MONEL METAL

Monel Metal contains approximately 67% nickel, 27% copper and 6% of other metals, principally iron and manganese; and with its high tensile strength and its non-corrosive properties greatly excels the best Manganese, Tobin or Phosphor Bronze.

Cast Monel Metal has a tensile strength of 70,000 lbs. per square inch, while the rolled metal is much stronger, having a tensile strength of 80,000 to 100,000 lbs. per square inch.

In appearance, Monel Metal cannot be distinguished from pure nickel and takes the same finish. Its great strength, together with its extreme incorrodibility, admirably adapt it for use in marine work and engineering construction, for parts that come in contact with salt water and for valves and fittings that are subjected to superheated steam.

Monel Metal can be furnished in any of the following forms: CASTINGS, RODS AND BARS, WIRE, FORGINGS, BOLTS AND NUTS.



**CASTINGS:** The greatest tonnage of Monel Metal Castings made up to the present time has gone into propellers for the U. S. Navy and private yachts. The Navy has also purchased castings for pump linings, steam turbine nozzles and valve fittings for superheated steam. Many castings have been made for use in dairy machinery, refrigerating plants, and pickling apparatus in steel mills. Various other castings that have been made are thermometer wells, gear blanks, large washers and nuts, deck fittings for yachts, pump parts, radiator castings, etc.

**RODS:** Hot rolled Monel Metal rods up to 6" diameter have been furnished principally for pump rods. Small sizes of rounds and squares are extensively used for bolt and nut stock. Rolled rods are now used for steam turbine parts, stock for drop forgings, electrical apparatus, motor boat shafting, pickle pins and valve stems.

**WIRE:** Monel Metal wire can be furnished in all gauges from B & S No.  $\frac{1}{8}$ " up to No. 40. It is used for wire cloth, motor cycle spokes, rope for wire hoists and cableways, nails, screws, rivets, etc., and innumerable other applications where high tensile strength, combined with non-corrosive features are essential.

**FORGINGS:** Monel Metal forgings show tensile tests, equivalent to steel. The importance thereof can be readily appreciated for parts of gas, oil or internal combustion engines of all types; automobile and motor boat fittings; steam turbine fittings and innumerable applications requiring a metal that will stand up under the most severe conditions.

The Bayonne Casting Company can make castings of Monel Metal from customers' patterns, of any size or description up to 25,000 lbs. in weight in one piece. The plant has been equipped to produce such castings as promptly and at as low a cost as is compatible with first-class workmanship. They will be pleased to furnish hot rolled rods at the lowest prices. Monel Metal can be obtained in the form of ribbon, round and flat wire, although this is not carried in stock because of the great variations in sizes required. Prices of forgings, bolts and nuts of the various types and sizes will be promptly quoted on request.

## BRIDGEPORT BRASS COMPANY

BRIDGEPORT, CONNECTICUT

**SEAMLESS DRAWN BRASS AND COPPER TUBING FOR ALL PURPOSES;  
ALSO CONDENSER TUBES—BRASS AND ADMIRALTY MIXTURE,  
TINNED AND PLAIN; FERRULES OF ALL KINDS**



### SEAMLESS DRAWN BRASS AND COPPER TUBING

Our tubing is made from the ingot to the finished tube in our own mills, and in its manufacture the metal is worked and treated in such a way that a close grained, uniformly strong and tough wall is insured. *"Bridgeport" Seamless Tubing is guaranteed tubing of the highest quality.*



Every "Bridgeport" tube is rigidly tested to withstand 1000 lbs. (internal) water pressure.

The severity of the requirements in modern power station service demands the highest grade of Condenser Tubes—for Condenser Tubes of quality, specify "Bridgeport."

**BRONZE IN SHEET AND ROD.** "Bridgeport" Bronze has great tensile strength, and high elastic limit, is used for shafting, piston or plunger work. We are also manufacturers of Aluminum, Phosphor and Silicon Bronze.

**SPECIAL SHAPES** drawn or stamped from Brass, Copper, Bronze and German Silver. We make the articles from ingot to finished part. Send sample or blue-print for estimates.

# LUMEN BEARING COMPANY

## BUFFALO

### BRASS FOUNDERS

#### Lumen Bronze

25% lighter than a phosphor bronze of the same bearing capacity—and 40% less expensive on a high metal market.

|                       | Sand Cast       | Chill Cast |
|-----------------------|-----------------|------------|
| Tensile Strength      | 32-36000        | 40-45000   |
| Elongation            | 0%              | 0%         |
| Brinell Hardness      | 114-119         | 119-124    |
| Specific Gravity      | 6.9             |            |
| Weight per cubic inch | 0.25            |            |
| Shrinkage             | $\frac{3}{4}$ " |            |
| Compressive Strength  | 60000           |            |

#### L. B. Manganese Bronze

|                       | Sand Cast       | Chill Cast |
|-----------------------|-----------------|------------|
| Tensile Strength      | 72-84000        | 80-88000   |
| Elongation            | 22%-35%         | 26%-32%    |
| Brinell Hardness      | 109-119         | 124-130    |
| Specific Gravity      | 8.4             |            |
| Weight per cubic inch | 0.30            |            |
| Shrinkage             | $\frac{1}{4}$ " |            |

#### Gear Bronze

|                       | Sand Cast       | Chill Cast |
|-----------------------|-----------------|------------|
| Tensile Strength      | 31-35000        | 48-52000   |
| Elongation            | 6%-10%          | 8%-12%     |
| Brinell Hardness      | 72-77           | 100-105    |
| Specific Gravity      | 8.5             |            |
| Weight per cubic inch | 0.307           |            |
| Shrinkage             | $\frac{1}{8}$ " |            |

We issue pamphlets from time to time containing specific data about non-ferrous castings, and will gladly put your name on our mailing list, if so requested.

#### Phosphor Bearing Bronze

|                       | Sand Cast       | Chill Cast |
|-----------------------|-----------------|------------|
| Tensile Strength      | 24-30000        | 40-42000   |
| Elongation            | 5%-7%           | 3%-5%      |
| Brinell Hardness      | 65-70           | 86-89      |
| Specific Gravity      | 9.0             |            |
| Weight per cubic inch | 0.33            |            |
| Shrinkage             | $\frac{1}{8}$ " |            |

#### Special Bronzes

We are prepared to meet any commercial specifications and to produce in our castings the highest physical qualities consistent with any chemical formula. We maintain a fully equipped laboratory for the purpose of controlling our alloys. We have all facilities and tools, including a 50000 pound testing machine.

#### To Engineers

We invite you to visit our plant, at any time. Telephone Oxford 77—address 197 Lathrop St., near 1155 Sycamore St.

# AMERICAN VULCANIZED FIBRE CO.

ESTABLISHED 1873

WILMINGTON, DELAWARE

## VULCANIZED FIBRE

**Manufacture**—In the manufacture of fibre there are three factors absolutely essential to mechanical strength and electrical insulation: 1. Pure Raw Material. 2. Experience and care in the process of making. 3. Freedom from chemicals in the finished product.

American Vulcanized Fibre is made from raw stock free from iron, bone or other impurities.

The processes of manufacture are accurately and scientifically controlled.

The finished product undergoes rigid chemical analysis and physical test.

The sole makers of Original Vulcanized Fibre, we not only know how to make the best fibre made, but are constantly endeavoring to produce a better and more uniformly excellent product.

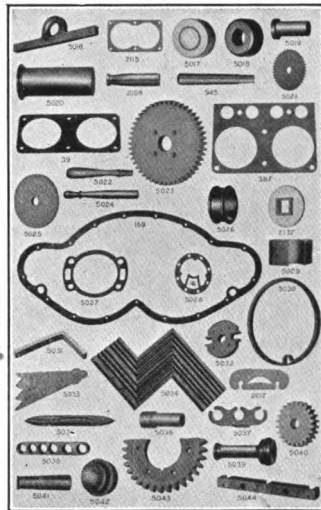
The result is a tough, homogeneous, horn-like material with the following valuable characteristics:—

**Characteristics:** Tensile strength 9,000–14,000 lbs. per sq. in.; Compressive strength 32,000–37,000 lbs. per sq. in.; Resistance to shearing 9,000–13,000; Specific Gravity 1.2–1.5; Electrical Rupture 200–400 volts per 1/1000 inch of thickness.

| COMPARATIVE TABLE           | Pounds per cu. ft. | Effect of Oil, etc. | Effect Rodents, Vermin, etc. | Brittle or Tough | Effect of Age |
|-----------------------------|--------------------|---------------------|------------------------------|------------------|---------------|
| VULCANIZED FIBRE...         | 85                 | None                | None                         | Tough            | Improves      |
| Porcelain, etc. ....        | 144                | None                | None                         | Brittle          | .....         |
| Hard Rubber .....           | 150                | Deteriorates        | .....                        | Brittle          | Deteriorates  |
| Rawhide, Leather, etc. .... | ....               | Deteriorates        | Destroy                      | Tough            | Deteriorates  |

### Applications

|                               |   |
|-------------------------------|---|
| Adjusters (Cord)              | Mirror Backs  |
| Baskets (Hop)                 | Packings  |
| Baskets (Mill)                | Pinions   |
| Baskets (Waste) "Vul-Cot"     | Rings   |
| Bases (Switch)                | Rods  |
| Bearings (Plain)              | Rollers   |
| Thrust, etc.)                 | Rolls (Pinking)                                     |
| Bobbins (Coil)                | Seats (Chair)                                       |
| Boxes                         | Shims (Switch)                                      |
| Bumpers (Textile)             | Shoe Horns  |
| Bushings                      | Shoes (Brake)                                       |
| Cans (Roving)                 | Staples (Insulating Saddle)                         |
| Checks (Factory Time)         | Straps (Brake)                                      |
| Cleats                        | Switch Bars   |
| Conduits (Interior)           | Tacks (Insulated Wiring)                            |
| Discs (all kinds)             | Tags  |
| Ferrules (Condenser, Handle)  | Telephone Cleats                                    |
| Frames (Bolster Case)         | Tie Plates  |
| Frictions                     | Trucks (Mill)                                       |
| Gaskets (Oilproof)            | Tubes   |
| Gears (Noiseless)             | Valves (Pumps)                                      |
| Gear Blanks                   | Washers (Friction, Thrust, Insulating, Compression, |
| Gibs (Engine, Crossheads)     | Cock, Pipe Union, Carriage Axle, Car Box)           |
| Handles                       | Wedges (Armature)                                   |
| Heads (Magnet, Bobbin, Spool) | Wheels  |
| Insulation (Rail Joint)       | Wiring Cleats                                       |
| Insulators                    | And many others.                                    |
| Linings (Clutch) "Auto"       |   |



A moment's thought will undoubtedly suggest to you applications not named above which will improve or cheapen your product or facilitate its manufacture.

Our Development Department is at your service to solve your problems, answer your inquiries or quote you prices.

## DIAMOND STATE FIBRE COMPANY

PRINCIPAL OFFICE: ELSMERE, DEL.

### BRANCH OFFICES:

|                      |  |                 |                   |
|----------------------|--|-----------------|-------------------|
| BRIDGEPORT, PA.      | NEW YORK CITY                            | ST. PAUL, MINN. | COLUMBUS, O.      |
| W. CONSHOHOCKEN, Pa. | SAN FRANCISCO, CAL.                      | ST. LOUIS, MO.  | CLEVELAND, O.     |
| CHICAGO, ILL.        | LOS ANGELES, CAL.                        | DETROIT, MICH.  | MILWAUKEE, WIS.   |
| BOSTON, MASS.        | NEW ORLEANS, LA.                         | BALTIMORE, MD.  | GREENVILLE, S. C. |
| PHILADELPHIA, PA.    | SEATTLE, WASH.                           | PITTSBURGH, PA. |                   |
|                      | DIAMOND STATE FIBRE Co., BERLIN, GERMANY |                 |                   |
|                      | HENRY LEMBKE, PARIS, FRANCE              |                 |                   |

### DIAMOND VULCANIZED FIBRE IN ALL FORMS



The Diamond State Fibre Co. is the largest manufacturer of Fibre in the world. The DI-SFI-CO Trademark is the guarantee of Superiority in Vulcanized Fibre products.

### UNWORKED DIAMOND FIBRE

Orders of any size can be filled from stock in the standard sizes of **SHEETS, RODS and TUBES**. The mills and warehouses are strategically located so that time may be saved by shipping from the mill nearest the customer.

### MACHINED PARTS

Diamond Fibre machined parts and specialties include gears, pinions, handles, discs, washers, gaskets, packings, switch bars, track insulation, etc., etc.

### FRICTION BOARD, SOFT FIBRE, INSULATING PAPERS, ETC.

DIAMOND INSULATION and DISFICO cover fully the various requirements of the mechanical and electrical trade.

### TRUCKS, MILL AND FACTORY BOXES, ETC.

Diamond Fibre Trucks, Waste Paper Baskets, Boxes, Barrels, etc., will not dent and bend like steel. Fibre Trucks in use 30 years are still in good condition.

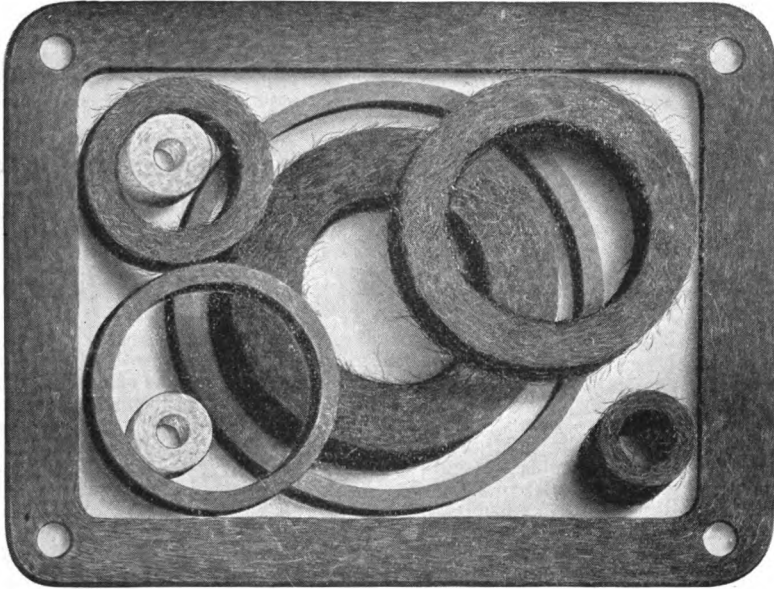
### PROMOTION DEPARTMENT

The Promotion Department of the Diamond State Fibre Co. will take up experimental work for you and tell you if fibre can be substituted to your advantage for some other more expensive material. Address all communications Promotion Department, Bridgeport, Pa.

## N. E. BOOTH

644 PACIFIC STREET, BROOKLYN, N. Y.

**MECHANICAL FELT GOODS OF ALL KINDS**



*Booth*

### **MECHANICAL FELT GOODS**

The line covers Felt Washers, Packings, Lubricating Pads, Insulating Materials, Wicks for Fan Motors and Machinery, Buffing and Polishing Wheels, Hand Blocks for Rubbing and Polishing, Discs for Electric Lamp Bulbs, all kinds of Dust and Weather Proofing Strips, Noise Preventing Typewriter Pads, and *a thousand and one other specialties* in the line of

#### **Felt for Manufacturers**

The machines used for this particular line of work have all been designed and built specially for us. The goods are produced quickly and economically and every concern using felt of any description for machinery or any mechanical appliance should write for samples and prices to N. E. Booth.

# GENERAL ELECTRIC COMPANY

GENERAL OFFICE: SCHENECTADY, N. Y.

## Branch Offices:

|                    |                    |                      |                      |
|--------------------|--------------------|----------------------|----------------------|
| Atlanta, Ga.       | Dayton, Ohio       | Los Angeles, Cal.    | Providence, R. I.    |
| Baltimore, Md.     | Denver, Colo.      | Louisville, Ky.      | Richmond, Va.        |
| Birmingham, Ala.   | Des Moines, Iowa   | Memphis, Tenn.       | Rochester, N. Y.     |
| Boise, Idaho       | Detroit, Mich.     | Milwaukee, Wis.      | Salt Lake City, Utah |
| Boston, Mass.      | (Office of Agent)  | Minneapolis, Minn.   | San Francisco, Cal.  |
| Buffalo, N. Y.     | Elmira, N. Y.      | Nashville, Tenn.     | St. Louis, Mo.       |
| Butte, Mont.       | Erie, Pa.          | New Haven, Conn.     | Schenectady, N. Y.   |
| Charleston, W. Va. | Fort Wayne, Ind.   | New Orleans, La.     | Seattle, Wash.       |
| Charlotte, N. C.   | Hartford, Conn.    | New York, N. Y.      | Spokane, Wash.       |
| Chattanooga, Tenn. | Indianapolis, Ind. | Niagara Falls, N. Y. | Springfield, Mass.   |
| Chicago, Ill.      | Jacksonville, Fla. | Omaha, Neb.          | Syracuse, N. Y.      |
| Cincinnati, Ohio   | Joplin, Mo.        | Philadelphia, Pa.    | Toledo, Ohio         |
| Cleveland, Ohio    | Kansas City, Mo.   | Pittsburg, Pa.       | Washington, D. C.    |
| Columbus, Ohio     | Knoxville, Tenn.   | Portland, Ore.       | Youngstown, Ohio     |

For Texas and Oklahoma business refer to Southwest General Electric Co. (formerly Hobson Electric Co.)—Dallas, El Paso, Houston and Oklahoma City.

For Canadian business refer to Canadian General Electric Company, Ltd., Toronto, Ont.

## COMPLETE ELECTRICAL POWER PLANT EQUIPMENTS AND SUPPLIES



The General Electric Company is the largest electrical manufacturer in the world. The monogram trade mark is known all over the world. It is the Guarantee of Excellence on Goods Electrical.

### GENERATING APPARATUS

The Curtis turbine is built in all sizes from the smallest exciter set to the 35,000 Kw. size—the largest in the world. They are suitable for condensing or non-condensing service, and are also furnished in low pressure or exhaust steam, and mixed pressure types. The latter can be used with high or low pressure steam or both. Steam extraction turbines are furnished where exhaust steam is needed for heating or manufacturing purposes. Engine driven generators are regularly furnished in capacities ranging from 5 to 1,000 Kw. direct current and from 100 to 5,000 Kw. alternating current. Water wheel driven generators have been built in all desired sizes and voltages up to 10,000 horsepower at 11,000 volts. The General Electric Company has had more experience than any other company in building high voltage generators. These machines do not deteriorate in their windings and are very conservative in temperature ratings.

### SYNCHRONOUS CONVERTERS—MOTOR GENERATORS

Synchronous converters and motor-generator sets provide an economical method for changing electric power of any standard frequency and voltage from alternating to direct current or vice versa.

### SWITCHBOARDS

For all ordinary requirements the necessary panels can be selected from the G-E catalogs of Standard Unit Panels, and combined into a switchboard that will satisfy every requirement of the installation. The advantages of this method are convenience in ordering, prompt shipment and low price, the latter two resulting from the elimination of engineering and drafting on the individual order.

For high voltage plants and other cases where unusual requirements must be met, special switchboards are designed to meet any conditions of control.

Switchboard specialists are located at many of the principal offices of the company and will furnish data which will enable the engineer to specify a complete switchboard especially adapted to his particular requirements and with all parts built, assembled and tested as a unit by one company.

### INSTRUMENTS—METERS

Switchboard and testing instruments and all kinds of electric meters cover fully the requirements for measurement of power.

### REGULATORS

Automatic regulators are furnished for keeping the voltages constant on alternating or direct current power and lighting circuits.



## **GENERAL ELECTRIC COMPANY**

### **TRANSFORMERS**

Type H distributing transformers have unusually high factors of safety to ensure reliable service under the severest operating conditions, such as sleet, snow, lightning, overload, etc. The General Electric Company has standardized and carries in stock complete lines of these transformers in capacities 200 KV-A and less for potentials 6,600, 10,000, 13,200, and 33,000 volts.

G-E power transformers are built in sizes up to 15,000 KV-A and are operating very successfully on potentials as high as 150,000 volts. These transformers have superior features which ensure unusual ruggedness when operating under modern transmission conditions of high power and high potential where the strains due to abnormal current, voltage and frequency are unusually severe.

### **LIGHTNING-ARRESTERS**

For alternating current circuits the aluminum arrester is recommended as giving the best protection attainable for station equipment.

For distributing transformers, the graded shunt resistance multiplex, or the compression chamber multiplex arrester may be used. The former is sensitive over a wide range of lightning frequencies and should be installed for protection of the larger transformers. The compression chamber arrester, lower priced and slightly less efficient, should be used to protect all the smaller transformers.

For direct current circuits two types of magnetic blowout arresters are available. Where a very high degree of protection is desired, aluminum arresters should be used.

### **WIRE AND CABLE**

The General Electric Company manufactures wires and cables insulated with paper, varnished cambric, rubber or composite (graded) insulation. To meet different conditions of service these cables are furnished with protective coverings of cotton, asbestos, lead, band steel or wire armor.

### **LAMPS, INCANDESCENT AND ARC**

Standard lighting units ranging from a 10 watt Edison Mazda lamp to the flame arc lamp for lighting large areas are carried in stock. Lighting specialists and illuminating engineers of the General Electric Company will assist in laying out any lighting system.

### **WIRING DEVICES**

G-E Reliable wiring devices include panel boards, fuses, switches, terminals, insulators, etc. All these devices are N. E. C. standard.

### **MOTORS AND CONTROLLERS**

**ALTERNATING CURRENT MOTORS** for 110, 220, 440 and 2,200 volts at all standard frequencies; constant or variable speed; for continuous or intermittent duty; hand or automatic control.

**DIRECT CURRENT MOTORS** for 115, 230, and 550 volts; slow or moderate speed; belt, chain, gear or direct drive. Constant, variable, or adjustable speed for continuous or intermittent duty. Suitable control for any service.

All motors are insulated for long life. Specially insulated motors for service in acid or alkaline vapors, excessive alkaline dust, or temperatures as high as 150° C. can be furnished.

The General Electric Company has a motor for every power application, large or small, a controller for every motor, and a specialist who can assist in the combined application to obtain the most satisfactory and economical results.

### **FLOW METERS**

The General Electric Company has developed a practical device for measuring the flow of steam in pipes. The G-E Steam flow meter can be installed in any sized pipe at a small expense, and will give reliable readings of the flow. They are specially useful in the boiler plant and turbine room for measuring the output of the individual boiler and the input of the turbines. G-E Flow Meters are also furnished for measuring the flow of water, air and natural gas.

### **BULLETINS—FURTHER INFORMATION**

Only a few of the products of the General Electric Company are described above. Bulletins, giving information, illustrations and full data on complete electrical apparatus for the power house will be mailed on application from our nearest office.

4939

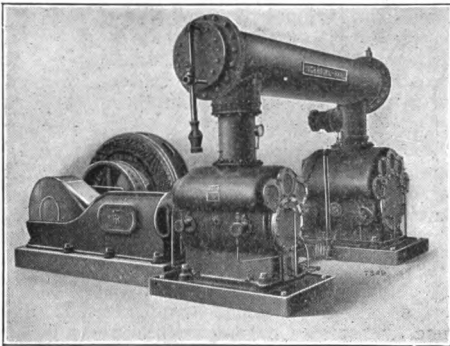
## INGERSOLL-RAND COMPANY

11 BROADWAY, NEW YORK, U. S. A.

Offices in all Principal Cities of the World

**BUILDERS OF AIR AND GAS COMPRESSORS, PNEUMATIC HAMMERS, PNEUMATIC DRILLS, AIR MOTOR HOISTS, AIR MOTORS, PNEUMATIC SAND RAMMERS, AIR LIFT PUMPS, AIR POWER MACHINERY OF ALL KINDS.**

### "INGERSOLL-ROGLER" COMPRESSORS



This type of compressor combines a number of new and important features, principle among which is the new type of Air Valve—the "Ingersoll-Rogler"—simple in design, durable and noiseless, and efficient in operation.

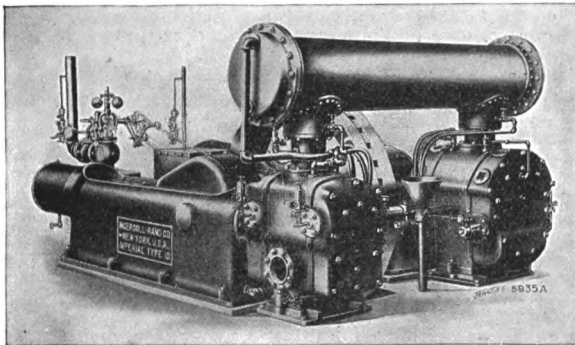
It is built in both straight line and duplex types; power driven, by gear, silent chain, belt, rope, or direct shaft connection to electric motor or water wheel, in single stage, two stage or multi-stage. This line affords a wide range of capacities from 10 to 50,000 cubic feet of delivered air.

Pressures from vacuum to 1000 pounds gauge.

Bulletin 3024.

### "IMPERIAL" AIR COMPRESSORS

The "Imperial" has long been well and favorably known to the trade. Every refinement has been employed to make the "Imperial" a highly efficient and economical machine. It is built in both power and steam driven types, with



duplex air cylinders, single or two stage. Steam cylinders are balanced Meyer adjustable cut-off and Corliss. Capacities range between 200 and 3400 cubic feet. Pressures vacuum to 110 pounds.

Bulletins

3311

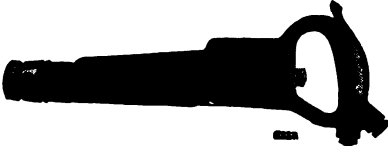
3312

3123

Descriptive Bulletins on Request

## INGERSOLL-RAND COMPANY

### **"LITTLE DAVID" RIVETERS AND CHIPPERS**



These hammers have a number of desirable features—which appeal to the operator and owner alike. They are practically vibrationless, easy to handle and durable. They strike sharp rapid blows and will drive rivets faster and better than any other type.

Bulletin No. 8011.

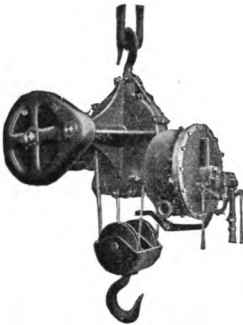
### **"LITTLE DAVID" PNEUMATIC DRILL**



This is a new machine, built and sold on the following basis:—It has only two-thirds as many parts as any other drill—does more work per unit of power than any other—requires less attention and costs less for repairs than any other. All standard sizes and types.

Bulletin No. 8107.

### **"IMPERIAL" AIR MOTOR HOISTS**



The hoisting problem—handling work and materials in shop, foundry, warehouse, factory—finds its most economical solution in this silent-running, self-oiling, wholly-enclosed, self-braking hoist. The five sizes have capacities of  $\frac{1}{2}$ , 1, 2,  $3\frac{1}{2}$  and 5 tons, working under ordinary pressures.

Bulletin No. 8006.

### **"IMPERIAL" AIR MOTORS**

(Not Illustrated)

This is a high-grade 3-cylinder wholly-enclosed motor splendidly adapted for running grinders, small tools, small cranes, or other light intermittent service. Two sizes give 2 and  $3\frac{1}{4}$  H. P.

Bulletin No. 8006.

### **"CROWN" SAND RAMMERS**

Experience all over the country has demonstrated that improved castings, larger output, and lower castings cost result from the adoption of "Crown" Pneumatic Rammers in the foundry. And they are built to withstand the hard conditions of foundry service. Both floor and bench types can be had. This machine has also proved useful in ramming concrete in construction work.

Bulletin No. 8308.

**Descriptive Bulletins on Request**



# NATIONAL BRAKE & ELECTRIC CO.

WORKS AT MILWAUKEE, WIS.

## DISTRICT SALES OFFICES:

165 Broadway  
New York

827 Railway Exchange  
Chicago, Ill.

318 Security Bldg.  
St. Louis, Mo.

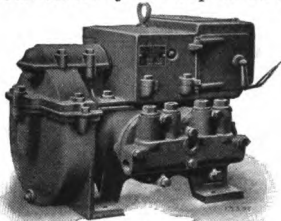
9th and Penn Ave.  
Pittsburgh, Pa.

**MANUFACTURERS OF NATIONAL AIR COMPRESSORS, BOTH  
STATIONARY AND PORTABLE, MOTOR, GAS, AND BELT DRIVEN**

The National Brake & Electric Co. are the pioneers in the designing and building of motor-driven air compressor units. Its products are designed by specialists of extended experience in the art and are manufactured in shops especially equipped for the production of motor driven air compressors.

## NATIONAL STATIONARY COMPRESSORS

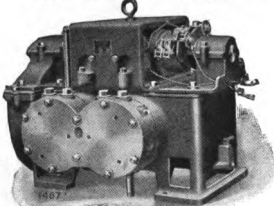
Primarily these compressors were designed for use in connection with air brake equipments in electric cars, a service requiring an unusual degree of efficiency, reliability, compactness, ease of access and quiet operation. They have been carefully developed to their present state of perfection and embrace advanced features of construction.



Type "H"—D. C. Compressor

### TYPE "H"—D. C. MOTOR DRIVEN

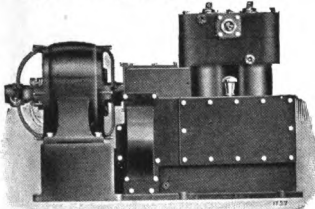
These compressors with capacities ranging from 11 to 50 cubic feet of free air per minute are built for pressures not exceeding 100 pounds, unless otherwise specified. They are equipped with D. C. motors of the enclosed type and are built for intermittent service, with limited periods of work and rest.



Type "L"—D. C. Compressor

### TYPE "L"—D. C. MOTOR DRIVEN

When conditions necessitate a continuous supply of compressed air in small quantities, National Type "L" Compressors will be found singularly adapted to such requirements. This type of compressor is built in capacities ranging from 11 to 40 cubic feet of free air per minute and designed for pressures not exceeding 100 pounds unless otherwise specified.



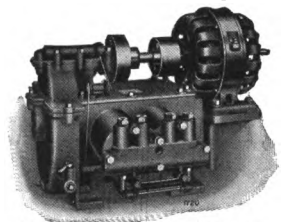
Type "E"—D. C. Compressor

### TYPE "E"—D. C. MOTOR DRIVEN

These compressors are built for continuous service in capacities of 50 to 100 cubic feet of free air per minute and for pressures not exceeding 100 pounds, unless otherwise specified.

### TYPES "H," "L" AND "E" A. C. Motor Driven—1, 2 and 3 phase

Standard polyphase induction motors require that the compressor be unloaded at the time of starting and all types H, L & E induction motor driven compressors (2 and 3 phase) are equipped with a manual unloader, unless otherwise specified. When complete automatic control is desired, polyphase alternating current motor driven compressors can be furnished with National Automatic Governor for closing and opening the motor circuits when the air pressure has reached a predetermined minimum or maximum, together with a National Centrifugal type Unloader, which automatically unloads the compressor at the time of shutting down and keeps it in an unloaded state until the motor has again been started and attained nearly its normal full speed.



Type "H"—A. C. Compressor

Ask for Catalog F400

## NATIONAL BRAKE & ELECTRIC CO.

### TYPE "3VS"—A. C. AND D. C. MOTOR DRIVEN

The National Type "3VS" Air Compressor has been designed to meet the constantly increasing demand for a self-contained electrically driven air compressor unit.

The air compressors of this type have completely water-jacketed cylinders and cylinder heads; are designed for continuous service, and are built in standard capacities of 50, 100, 150, 225 and 300 cubic feet of free air per minute.

Type "3VS" motor driven compressors are equipped with complete automatic controlling devices, which permit the starting of the direct current compressors with not to exceed one half full load current, and the alternating current compressors with not to exceed full load current. They are also equipped with automatic unloader and automatically controlled water valves. National combined automatic controlling devices for motor driven compressors are absolutely reliable and efficient.

### TYPE "3VD"—A. C. AND D. C. MOTOR DRIVEN

This compressor is designed for continuous service and is built in one size only, having a piston displacement of 550 cu. ft. per minute, and is equipped with the same design of combined automatic controlling devices as the "3VS", except being arranged for higher duty.

### NATIONAL STATIONARY COMPOUND AIR COMPRESSORS

#### TYPE "Q-L" AND "Q-E"—A. C. AND D. C. MOTOR DRIVEN

National Type "Q" Compressors, with capacities ranging from 7 to 70 cubic feet of free air per minute, are intended for service where conditions necessitate the constant delivery of air at high pressures, within the maximum limits, however, of either 200 or 350 pounds. In the latter instance, the compressor, in comparison with that rated at 200 pounds pressure, will have reduced displacement capacity to offset increased pressure.

### NATIONAL PORTABLE AIR COMPRESSORS

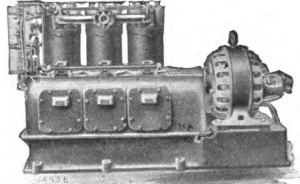
National Portable Air Compressor Outfits are ideally adapted for use in mercantile establishments, mines, quarries, manufacturing plants, and in construction work, where the available floor space is limited, or the nature of the work requires that a supply of compressed air be delivered in different places and under constantly changing conditions.

These portable outfits can be equipped with the same type of motor compressor and controlled in the same manner as any of the National Stationary Compressors previously described.

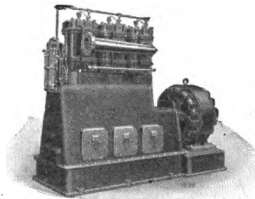
### NATIONAL GAS DRIVEN AIR COMPRESSORS

With the increased adoption of gas motors there has been a constantly increasing demand for "National Air Compressors" driven by gas motors. These self-contained units of power will be found most efficient and economical for contracting and construction work, especially where electric power or steam is not available. The same superior features of design that characterize National Type "E" and "3VS" motor driven air compressors are embodied in National Type "E" and "3VS" Gas Driven Air Compressors.

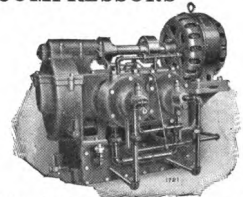
Ask for Catalogs F400 and F401



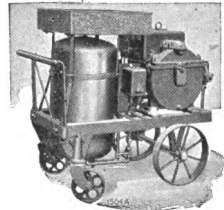
Type "3VS"—A. C. Compressor



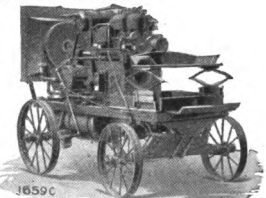
Type "3VD"—A. C. Compressor



Type "Q-L"—A. C. Compressor



Type "H" Portable Compressor



Type "E" Gas Driven Portable Compressor

## THE VILTER MANUFACTURING CO.

1070-1088 CLINTON ST., MILWAUKEE, WIS., U. S. A.

### DISTRICT SALES OFFICES IN U. S.

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28 West Broadway,  
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**BUILDERS OF ICE MAKING AND REFRIGERATING MACHINERY,  
CORLISS ENGINES, PASTEURIZERS, MACHINERY FOR BREWERS  
AND BOTTLERS, ETC., AMMONIA FITTINGS.**

### VILTER HEAVY DUTY AMMONIA COMPRESSORS

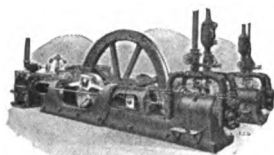


Fig. 1

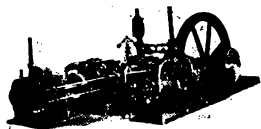


Fig. 2

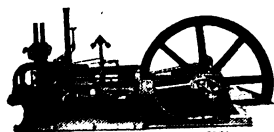


Fig. 3

Fig. 1 illustrates a duplex steam driven unit with horizontal double acting ammonia compressors, direct connected to cross compound Corliss Engine. Compressors equipped with multiple valve heads, giving maximum area. Stuffing box of the double-packed type, with oil seal and pressure release. The duplex type is built in sizes from 125 to 750 tons daily refrigerating capacity.

Fig. 2. A simple heavy duty steam driven unit, direct connected to tandem compound Corliss Engine. The design is wonderfully free from complication, and the construction is such as will insure satisfactory service and freedom from trouble. The heavy duty frame is of straight line design, of massive construction. Built in sizes from 50 to 375 tons daily refrigerating capacity.

Fig. 3. This unit is of the same design as the above, being, however direct connected to a simple heavy duty Corliss Engine. The base of the frame extends from the pillow block around the solid crank pit, and then, sloping to the top of the guide section, forms a rigid outer base for the latter, and brings all the working strains within the lines of the frame. Built in sizes from 40 to 375 tons daily refrigerating capacity.

### VILTER STANDARD AMMONIA COMPRESSORS

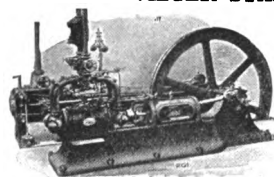


Fig. 4

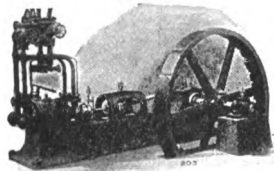


Fig. 5

Fig. 4. The standard frame is of box formation and is cast in one piece up to and including the 50 ton size; i.e., the compressor chamber, guide section and pillow block are integral. Above that size the pillow block section forms a separate casting, which is staunchly bolted to the guide and compressor section, forming a rigid unit. This type is built in sizes from 6 to 160 tons daily refrigerating capacity.

Fig. 5. The belt driven machines are furnished in both the standard and heavy duty styles, either single or duplex. Belt wheels or wheels grooved for ropes can be supplied. These units may be driven by any power, such as electric motor, gas or oil engines, etc. Single units built in sizes from 6 to 175 tons daily refrigerating capacity; duplex units in sizes from 12 to 750 tons daily refrigerating capacity.

## THE VILTER MANUFACTURING CO.

### VILTER SMALL CAPACITY VERTICAL AMMONIA COMPRESSORS

Fig. 6. A small single acting compressor, especially designed for users of comparatively small quantities of refrigeration. The design unites the base, main bearing and crank case in a single massive casting, cylindrical sections being used throughout, giving simplicity, symmetry and strength, with a low center of gravity and perfect alignment. Single units, either belt or steam driven, made in sizes from 1.11 to 12.6 tons daily refrigerating capacity. Duplex units, belt driven only, made in sizes from 2.22 to 25 tons daily refrigerating capacity.

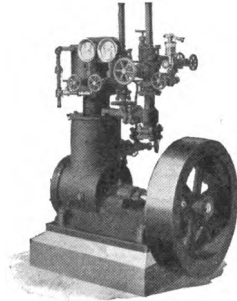


Fig. 6

### VILTER CORLISS ENGINES

Fig. 7. Rolling Mill Type. This engine is of massive construction throughout, and is adapted to any class of service, from the steady belted load to direct connected electrical service, in which the engine is subjected to heavy and variable loads. Built for high steam pressures and high rotative speeds, and may be used with superheated steam up to 100° Fahrenheit superheat. Valve gear of the high speed type; all valves double ported. Built in all sizes, either simple, tandem compound or cross compound.



Fig. 7

Fig. 8. Girder Frame Type. The girder frame Corliss Engine is exceedingly strong and rigid, and is designed to take shocks and overloads without possibility of misalignment. Adapted to any class of ordinary mill or electric light service. Recommended for steam pressures up to 100 pounds per square inch. The same valve gear is used as for the rolling mill type engines. Made in 26 sizes, from 25 horsepower up.

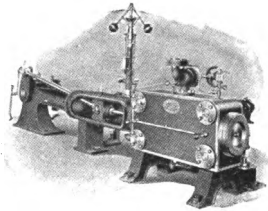


Fig. 8

### THE "BADGER" PASTEURIZER

Fig. 9. A newly designed machine, of wonderful simplicity, for pasteurizing milk or beer in the bottle. Made in any capacity and of various styles to fit the requirements.

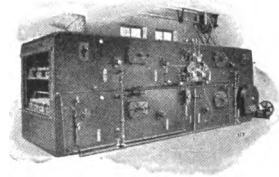


Fig. 9

### LITERATURE

Bulletins, catalogs and full data regarding our products will be mailed on request.

## P. H. & F. M. ROOTS COMPANY

HOME OFFICE, CONNERSVILLE, IND.

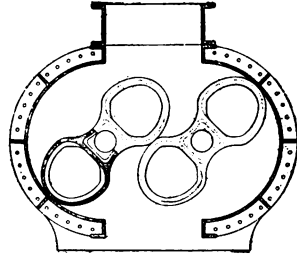
NEW YORK OFFICE, 120-122 Liberty St.

CHICAGO OFFICE, 1245 Marquette Bldg.

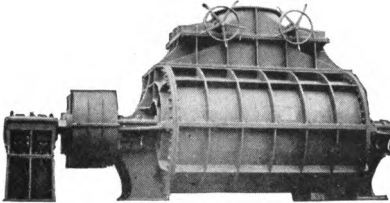
**MANUFACTURERS OF ROTARY POSITIVE PRESSURE BLOWERS, GAS EXHAUSTERS, PUMPS, FLEXIBLE ROPE COUPLINGS**

### ROOTS ROTARY BLOWERS

The air from the suction side follows the movement of the impeller lobe until the opposing lobe traps it between the case and the impeller after which the continued revolution brings the air to the discharge side where the rolling together of the impellers prevents its return.



Sectional View Showing Interior Construction



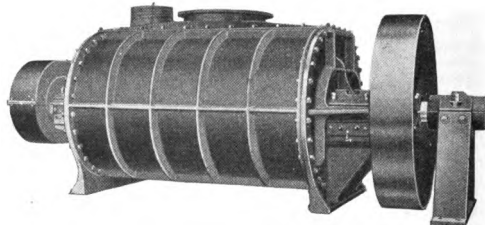
Smelting Blower, Single Geared, Double Outboard Bearing with Double Acting, Quick Opening Blast Gate

### ROOTS SMELTING BLOWERS

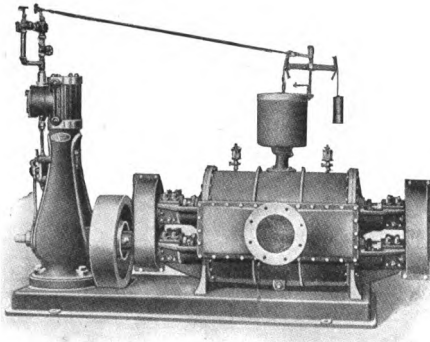
These Blowers of full length are nominally built for two pounds pressure but they are capable of operating under two and one-half pounds. All bearings are quarter box constructed, with removable shells to meet hard service, easy adjustment and quick renewal. Sizes range up to 400 foot machines.

### ROOTS FOUNDRY BLOWERS

Used for Cupolas, Oil Furnaces and any Low Pressure Service.



Foundry Blower with Pulley and Outboard Bearing



Gas Exhauster, Engine Drive, Float Governor

### ROOTS GAS EXHAUSTERS

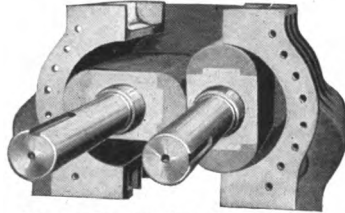
Our Exhausters are used for handling Foul Gas and High Pressure Booster Service. We can meet any condition of capacity or pressure up to and including ten pounds pressure.



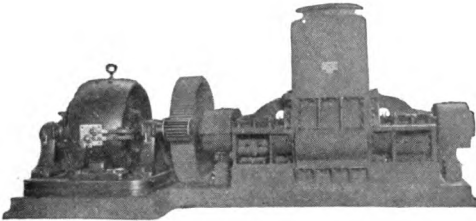
## P. H. & F. M. ROOTS COMPANY

### ROOTS ROTARY WATER PUMPS

Briefly, the operation of the Pumps is as follows: The revolution of the shafts and impellers traps the water between the lobes and the case, delivers it to the discharge side, where the rolling together of the impellers on the center lines of the shaft prevents the return of the water.



Interior Construction of Rotary Pump

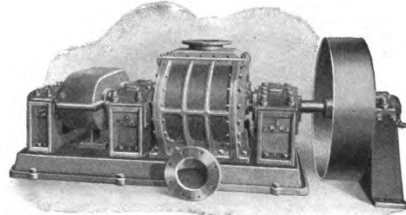


Direct Connected Motor and Pump

These Pumps handle any liquid substance not containing grit, under any head from ten to two hundred feet, with an economy ranging from 75 per cent to 85 per cent of the power applied to the Pump shaft.

### ROOTS ROTARY VACUUM PUMPS

In the design of these Vacuum Pumps we have been guided by results obtained in their operation. These Pumps are all built for down discharge because this construction relieves them of all shock and vibration due to discharging water. All Pumps are furnished with our patented leather stuffing box which is kept soft with water.



Vacuum Pump with Pulley and Outboard Bearing

### FLEXIBLE ROPE COUPLINGS

This Coupling is now used on a large percentage of our direct connected Blowers, Exhausters and Pumps. The points of advantage that place it ahead of other designs for the same purpose are these:

First—It corrects for misalignment in any direction whether due to settling of foundations, wear of engine bearings, or original setting, thus saving uneven wear and heating.

Second—It takes care of end thrust caused by heating, wear of bearings or oscillations of the driving mechanism.

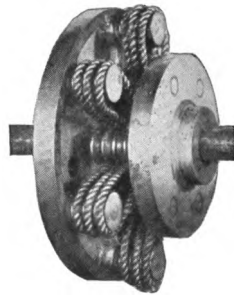
Third—It eases up sudden fluctuations of load by the swing of the loop.

Fourth—It permits rotation in either direction, with equal results and symmetrical positions.

Fifth—The ropes can be removed as quickly, as the bolts in a solid coupling can be taken out.

Sixth—With ropes off, either the driving or driven machine can be rotated without interference.

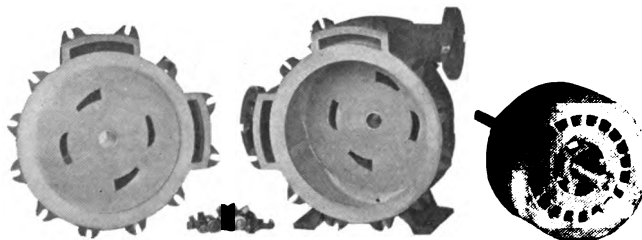
Seventh—The life of the ropes is long and they can be renewed at small expense.



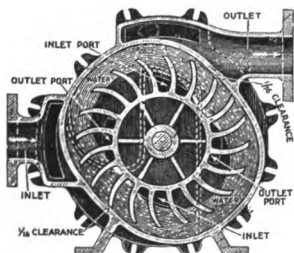
## THE NASH ENGINEERING CO.

SOUTH NORWALK, CONN., U. S. A.

EXCLUSIVE MANUFACTURERS OF THE HYDRO-TURBINE AIR  
COMPRESSORS AND VACUUM PUMPS



CASING HEAD AND ROTOR CONSTITUTE THE ENTIRE PUMP. Note the total absence of gears, valves, loose-moving or reciprocating parts. The rotor runs with a large clearance. All strains due to compression are removed from the shaft and bearings because the air is compressed simultaneously on opposite sides of the rotor.



The water follows the case due to centrifugal force. Twice in a revolution the water recedes from the rotor thereby leaving spaces between the blades into which air is drawn through the inlet ports. The water then surges back into the rotor, compressing and delivering the air through the outlet ports.

The Simplicity of the Nash Hydro-Turbine principle means: A *high grade* air compressor and vacuum pump at a *reasonable price*; a compressor which can be operated by *anyone*; a compressor which will run *continuously* on 24-hour service with *undiminished efficiency*.

The air is delivered without pulsation. No Air receiver is required. The space occupied is less than that of any other compressor of the same capacity. No elaborate Foundations are necessary. There is no vibration or noise. Absolute reliability, durability and constant high efficiency is assured.

The air is thoroughly washed by the water in passing through the pump, and is delivered entirely free from Hydro-Carbon compounds due to the decomposition of the lubricant.

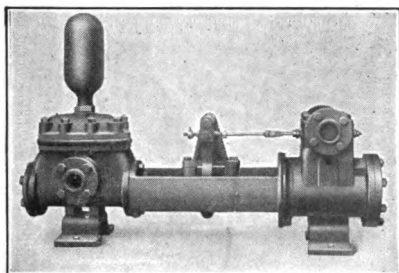
This puts the pump in a class by itself for agitating liquids, particularly cyanide solutions, for exhausting from gas producers, for air pressure filtration, and any process requiring clean air.

WRITE FOR DESCRIPTIVE CIRCULAR 2F.

## THE BLAKE & KNOWLES STEAM PUMP WORKS

MAIN OFFICE: 115 BROADWAY, NEW YORK

FACTORY: EAST CAMBRIDGE, MASS.

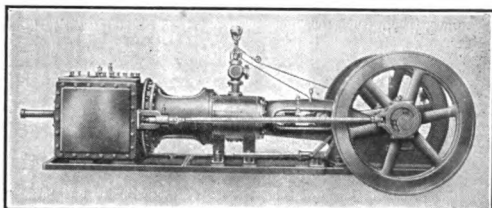
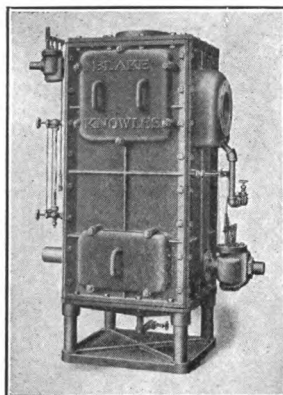


### IMPROVED SIMPLEX PUMPS

For Boiler Feeding, Pressure,  
Tank and Vacuum Service.  
Horizontal and Vertical Patterns

### FEED WATER HEATERS

Open and  
Closed  
Types



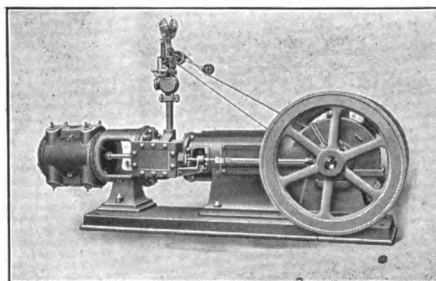
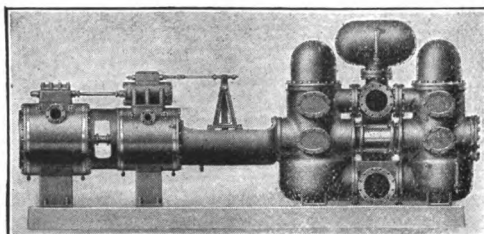
### ROTATIVE DRY VACUUM PUMPS

Steam and Power

For High Vacuum Service

### SINGLE COMPOUND PLUNGER PUMPS

For Boiler Feeding,  
Elevator Service, etc.



### CLIMAX ENCLOSED FRAME AIR COMPRESSORS

Single and Duplex: Steam or Power Driven

Branch Offices in all Principal Cities

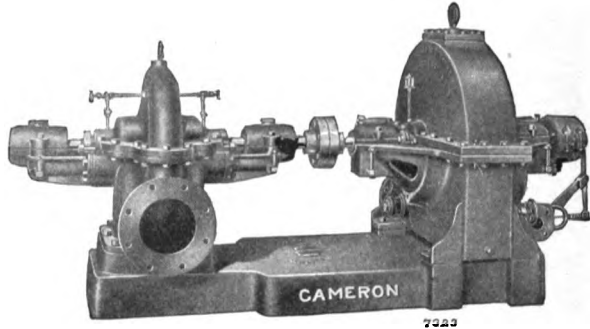
B244.S

## **A. S. CAMERON STEAM PUMP WORKS**

11 BROADWAY, NEW YORK

**DESIGNERS AND BUILDERS OF CENTRIFUGAL AND TRIPLEX ELECTRIC PUMPS; SIMPLE AND COMPOUND, PISTON AND PLUNGER PUMPS FOR ALL CLASSES OF SERVICE.**

**CAMERON  
DOUBLE  
SUCTION  
VOLUTE PUMP**

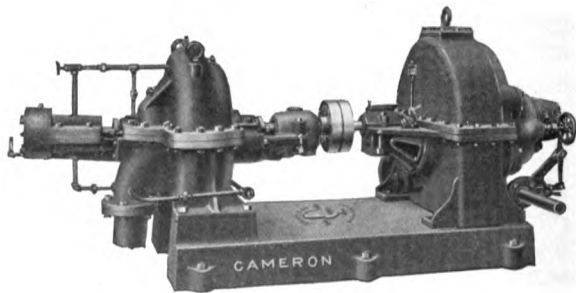


Cameron Centrifugal Pumps are the most modern in design, and they give the highest efficiencies.

The Double Suction Volute Pump is especially adapted for general service. The casing is horizontally split, allowing quick, easy access to all working parts. The impeller is enclosed, and perfectly balanced. Built for capacities from 50 to 7500 gallons a minute. Can be direct-connected to steam turbine or other forms of power drive.

*Bulletin No. 150*

**CAMERON  
MULTI-STAGE  
TURBINE  
PUMP**



The Cameron Multi-stage Turbine Centrifugal Pump is simple and compact, strong and dependable. All parts accessible by means of the horizontally split casing.

It gives an exceptionally high efficiency over a wide range of capacity. The cost of upkeep is very low.

It is built in two, three and four stages for a wide variation of speed and capacity, and may be driven by steam turbine or any available motive power.

*Bulletin No. 151*

Cameron Steam Pumps have fewer working parts than any other steam pump, and none exposed. Only four pieces in the Steam Mechanism. By merely removing the valve chest cover on the water end the whole interior of the valve chamber is plainly visible.

All the way through they are compactly and ruggedly constructed.

Built in many types and sizes for all classes of service.

*Bulletin No. 102*

# THE CANTON-HUGHES PUMP CO.

WOOSTER, OHIO, U. S. A.

## MANUFACTURERS OF PUMPING MACHINERY

Canton-Hughes Pumps are of Duplex and Simplex, piston and plunger packed designs, and of superior construction, the result of long years of experience in steam pump building. Special attention has been given to reducing friction in these pumps to a minimum, the valve area and water passages being ample to secure this result. We have developed our repair system, so as to insure repair parts that will fit. In the design and manufacture, care has been taken to have all parts readily accessible, and of the very best workmanship and material.

### DUPLEX PUMPS

**Boiler Feed, Fire, Elevator, Ice Plant, Mine, Factory and General Service.**

These pumps possess the latest features: Lever Stands with long Bearings, Cross Heads quickly detachable—being split and clamped. Guides to keep Rods from turning, Separable Rods. Water Plunger and Rod can be removed without disturbing steam end. Built in sizes from 2¼"x1¼"x2" to 14"x9"x10". Capacities from 18 to 600 gallons per minute. The 2¼"x1¼"x2" size is especially built for oil pumping. Weight, 65 lbs. Used for cotton seed oil mills, laundries, boiler feeding, etc.

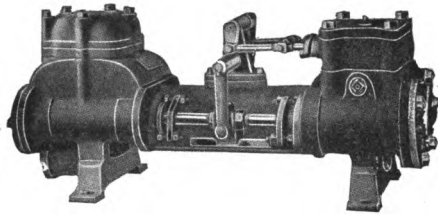


Fig. 8 Piston Type Boiler Feed Pump

**Duplex General Service Pumps.** Sizes up to 2,000,000 gallons daily capacity.

**The Canton-Hughes Ballast Pumps.** Designed for pumping ballast and for circulation. Compounded when desired. We have patterns for larger sizes to meet special requirements.

**Duplex Tank Pumps.** We make a large line of Tank Pumps, including sizes up to 6,000,000 gallons capacity.

**Outside Center Packed Duplex Pump.** Sizes from 6x4x6" to 24x14x24". Capacities 130 to 1598 gallons per minute.

**Outside End Packed Duplex Pump.** Sizes from 10x4x10" to 16x8x12". Capacities 130 to 520 gallons per minute.

### AUTOMATIC FEED PUMP

#### AND RECEIVER

These machines are desirable for receiving the condensation from heating systems; returning it to the boiler automatically without loss of heat. They are unequalled for use in hotels, factories, apartment houses, lumber mills, brick and cement plants, etc. Sizes from 3"x2"x3" to 8"x5"x10". Draining capacities from 5,000 to 65,000 sq. ft. of radiating surface.

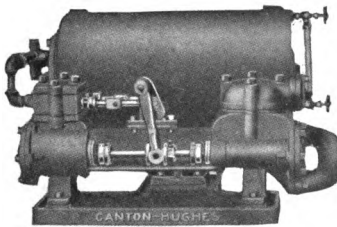


Fig. 162 Automatic Pump and Receiver

We manufacture a complete line of Steam Pumps and Hydraulic Machinery, including, in addition to the above, Underwriter Fire Pumps, conforming to the Underwriters' specifications—500, 750, 1,000 gallons capacity; Simplex or Single Cylinder Steam Pumps for Boiler Feed, General Service, Mine Pumping, Light Service, etc.; Canton Wet and Dry Vacuum Pumps, single pattern; Jet Condensers; Air and Circulating Pumps; Single and Duplex steam driven Air Compressors; Blowing Engines for Breweries, Refineries, Forges, Potteries, etc.—suitable for Air Compressor use, 15 to 30 lbs. pressure; Power Pumps; Duplex Hydraulic Pumps for pressures up to 6,000 lbs.; Sinking Pumps; High Duty Pumping Engines. Ask for Catalogue No. 25.

This catalogue shows several cuts of our Meyer Gear and Corliss High Duty Pumping Engine.

## CHICAGO PUMP COMPANY

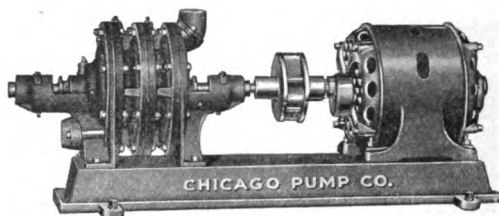
GENERAL OFFICES: 919 W. LAKE ST., CHICAGO, ILL.

**MANUFACTURERS OF ELECTRIC PUMPING MACHINERY; DUPLEX ELECTRIC SEWAGE EJECTORS, AUTOMATIC ELECTRIC BILGE PUMPS, LITTLE GIANT ELECTRIC CELLAR DRAINERS, PNEUMATIC WATER SYSTEMS, MULTI-STAGE TURBINE PUMPS, ELECTRIC HOUSE SERVICE PUMPS, AUTOMATIC CONDENSATION PUMPS AND RECEIVERS.**

### MULTI-STAGE TURBINE PUMPS

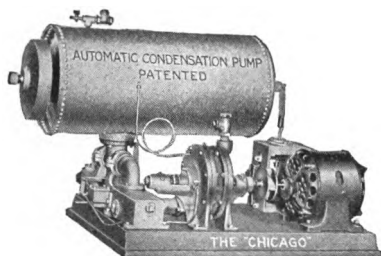
Our line of Multi-Stage Turbine Pumps which are fitted with Outer board Ring Oiled Bearings and Enclosed Type Balanced Impellers, is complete and perfect in construction. Capacities from 10 to 5,000 gallons per minute.

Write for full descriptive catalog.



Multi-Stage Turbine Pump

### AUTOMATIC ELECTRIC CONDENSATION PUMPS AND RECEIVERS



Automatic Electric  
Condensation Pump

We illustrate our "Chicago" Condensation Pump which is used for returning water of condensation into boiler, from radiation which may be located below water level of boiler. When a given quantity of water enters tilting receiving tank, it automatically starts motor by closing automatic switch, stopping same when water has been pumped out. There are no floats or any working parts inside this receiving tank. Floats crack, due to great changes in temperature, and are generally objectionable. Write for catalog, which fully describes the vari-

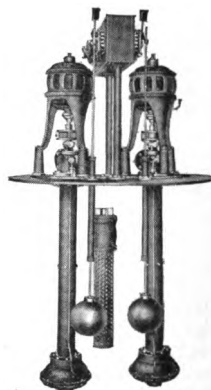
ous types of pumps we manufacture. Our engineers will gladly furnish you with copies of specifications covering any type of pump.

### DUPLEX ELECTRIC SEWAGE EJECTORS AND BILGE PUMPS

are built in sizes from 10 to 500 gallons per minute. We have made the scientific construction of Sewage Ejectors our chief study, and these are the results of years of experience and observation. We have eliminated all unnecessary and complicated parts, so that we now have the simplest, most compact and durable Ejector on the market.

#### Recent Chicago Installations

Westminster Bldg., A. S. Alshuler, Arch.  
Crane Bldg., Holabird & Roche, Arch.  
Blackstone Hotel, Marshall & Fox, Arch.  
Advertising Bldg., W. C. Zimmerman, Arch.  
University of Chicago, Shepley, Rutan & Coolidge, Arch.  
Joliet Union Station, Jarvis Hunt, Arch.  
Beloit College Bldg., Jenney, Mundie & Jensen, Arch.



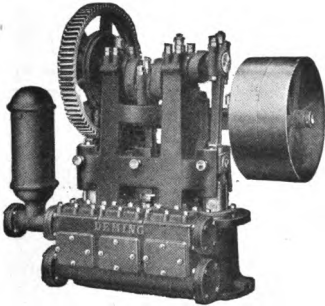
Type E Duplex Ejector

# THE DEMING COMPANY

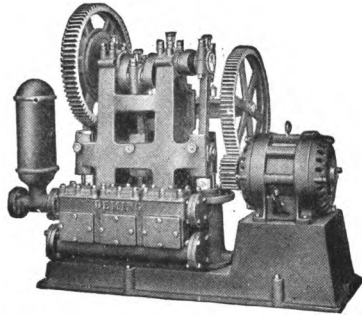
SALEM, OHIO, U. S. A.

NEW YORK OFFICE AND STOCK: 152 Chambers Street

**SINGLE AND DOUBLE ACTING TRIPLEX PUMPS; ARTESIAN WELL PUMPS AND CYLINDERS, FOR OPERATION BY ELECTRIC MOTORS, GAS OR GASOLINE ENGINES, OR BELT FROM SHAFT.**

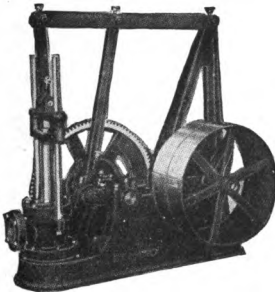


**Fig. 50, Size 7 x 8 to 8 1/2 x 8.**



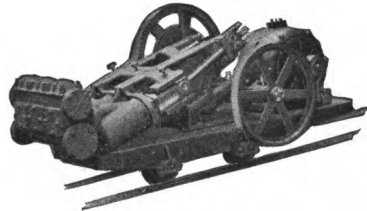
**Fig. 50, Size 5 1/2 x 8 with Type "B" Drive.**

Made in sizes from 2x2 to 13x14, with capacities of 300 gallons to 58,000 gallons per hour. For Waterworks, Boiler Feeding, General Water Supply, Etc.



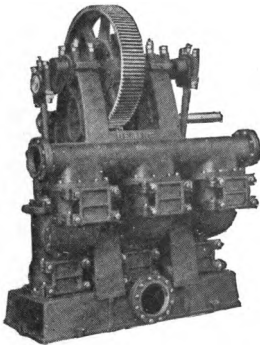
**Fig. 62, 10-inch Stroke.**

Made in three strokes, 10, 16 and 24". For Wells up to 300 ft. deep.



**Fig. 70, 5x6, Portable Mine Pump.**

Made in sizes from 3 1/2 x 4 to 8 1/2 x 8, with capacities of 1,800 gallons to 18,000 gallons per hour.

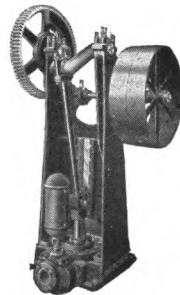


**Single Acting Triplex Stuff Pump for 75 lbs. Maximum Pressure.**

For Handling Paper Stock and Thick Liquids. Made in sizes from 4x6 to 11x12.

**Complete  
192 Page  
Power Pump  
Catalogue  
Mailed to  
Engineers  
on Application.**

**Deming Triplex Power Pumps Effect an Actual  
Saving of 33 1/3% over Steam Pumps.**



**Fig. 80, Deep Well Power Working Head with Differential Plunger.**

16" and 24" strokes, capacities 1,000 gallons to 4,500 gallons per hour. For wells 725 ft. deep or less.

# THE GOULDS MANUFACTURING CO.

SENECA FALLS, N. Y.

## PUMPS FOR EVERY SERVICE

The Goulds Line includes hand and power pumps for every service.

For 65 years Goulds Reliable Pumps have been generally recognized as the world's standard of quality. They are built to operate with the least possible power and all parts are made of the best materials to give long reliable service. They are rated conservatively, and every Goulds Pump is guaranteed to give reliable, satisfactory service under the conditions for which it is recommended.

They are adapted for belt drive or direct connection to electric motors, gas engines, steam turbines, water wheels, or other drivers. A few typical pumps from the line are illustrated on the opposite page.

### SINGLE-ACTING TRIPLEX PUMP

For 130 Pounds Working Pressure or 300 Feet Elevation

General Water Supply, Municipal Waterworks, Boiler Feeding, Hydraulic Elevators, Mine Pumping, Pulp Grinders, etc.

Illustration: Size 8"x10"—Capacity 720 gallons to 21,000 gallons per hour.

#### Specifications

|                             |   |
|-----------------------------|---|
| <b>Frame</b>                | Close grained iron cast in one piece with crosshead guides and cylinders, forming exceptionally rigid construction and accurate alignment of all working parts.   |
| <b>Crank Shaft</b>          | High carbon open hearth steel, accurately machined to gauge.  |
| <b>Bearings</b>             | Crank shaft and pinion shaft bearings are of babbitt metal.   |
| <b>Gearing</b>              | Gear and pinion, charcoal iron, machine cut from the solid. A gear guard covers the pinion and adjacent teeth of the gear. Gear ratio 5 to 1.   |
| <b>Crossheads</b>           | Babbitted and run in bored guides. 3½x4 in. and smaller crossheads, cast iron.  |
| <b>Connecting Rods</b>      | Fitted with adjustable bronze boxes at crank end (except 3½x4 in. and smaller sizes which have babbitted boxes) and bronze bushings at crosshead end.   |
| <b>Cylinders</b>            | Close grained iron cast in one piece with standards.  |
| <b>Plungers</b>             | Hard cast iron, accurately machined and ground true and smooth.   |
| <b>Glands</b>               | Iron and of easy access for adjustment.   |
| <b>Base and Valve Boxes</b> | Charcoal iron in one casting, of liberal proportion, affording large valve area, direct waterways and easy access.  |
| <b>Valves</b>               | 3x4 in. and smaller, bronze valves. 3½x4 in. and larger—for cold water, rubber discs on bronze grid seats with cylindrically wound springs. For hot water we recommend the grid seat valve with special disc. |
| <b>Air Chamber</b>          | Supplied with Pump. Vacuum Chamber to order.  |
| <b>Special Construction</b> | Phosphor Bronze Plungers, Lined Cylinders and Glands, Raw-hide pinion, etc., to order.  |

#### Publications

The following bulletins, any of which will be sent on request, give complete specifications on the various standard types of Goulds Power Pumps.

- No. 100. Double-Acting, Single-Cylinder Piston Pumps.
- No. 101. Single-Acting Triplex Plunger Pumps, Outside-Guided Type.
- No. 102. Single-Acting Triplex Plunger Pumps, Trunk Plunger Type.
- No. 103. Single-Acting Triplex Plunger Pumps, Large Capacity and High Pressure Types.
- No. 104. Double-Acting Triplex Piston Pumps, Vertical Type.
- No. 105. Single-Stage, Single Side Suction Centrifugal Pumps.
- No. 106. Vacuum and Stuff Pumps.
- No. 107. Deep Well Triplex Pumps.
- No. 108. Deep Well Working Heads and Cylinders.
- No. 109. Pumps for Special Services.
- No. 110. Single-Stage, Double Suction Centrifugal Pumps.
- No. 111. Centrifugal Sump Pumps.
- No. 113. Rotary Pumps.
- No. 114. Vertical Single Stage Centrifugal Pumps.
- No. 115. Double-Acting Triplex Piston Pumps, Horizontal Type.
- No. 116. Single-Acting Triplex Pressure Pumps.
- No. 117. Air Pressure and Vacuum Pumps.

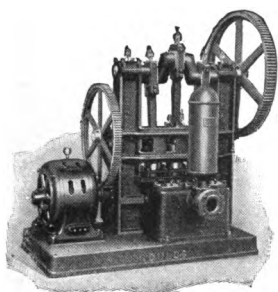
Bulletins on Multi-Stage Centrifugal Pumps in course of preparation.



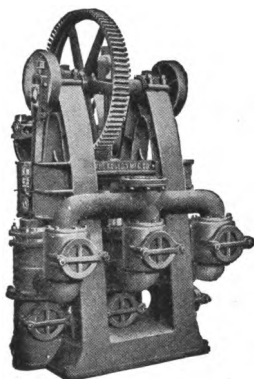
# THE GOULDS MANUFACTURING CO.

SENECA FALLS, N. Y.

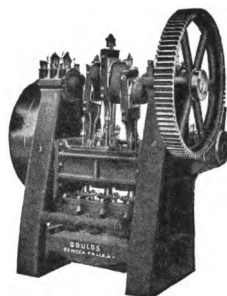
**PUMPS FOR EVERY SERVICE**



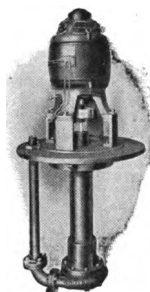
**Single-Acting Triplex Pump**



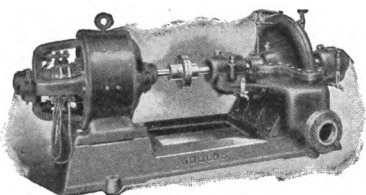
**Stuff Pump**



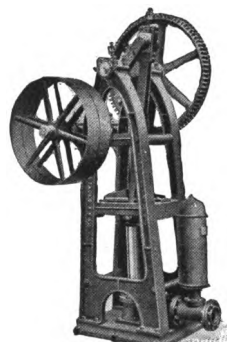
**Triplex Pressure Pump**



**Centrifugal Sump Pump**

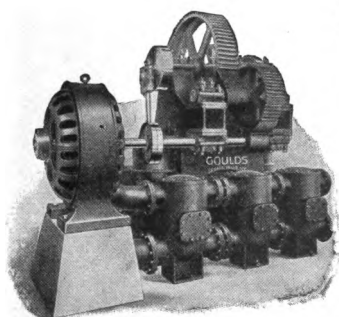


**Single-stage, Double-suction Centrifugal Pump**

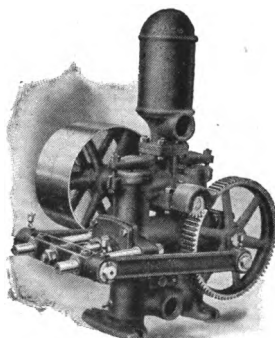


**Deep Well Working Head**

**Ask for bulletins on Power or Hand Pumps  
for any service in which you are interested.**



**Double-Acting Triplex Pump**



**Double-Acting Single Cylinder Pump**

# HALL STEAM PUMP COMPANY

PITTSBURGH, PA.

**BUILDERS OF AIR COMPRESSORS AND PUMPING MACHINERY**

## HALL AIR COMPRESSORS

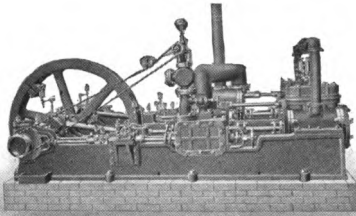
Our various types of Fly-Wheel Compressors include Single Steam and Power Compressors, Duplex Steam and Power Compressors, Tandem Compound Compressors, Cross Compound Compressors, Single and Compound Steam Ends, arranged to run Condensing or Non-Condensing.

Air Valves and Seats on all standard machines are of the poppet type and work vertically. They are made light as possible consistent with strength, and

being of steel are practically indestructible. Where special conditions require, we furnish machines fitted with positively moved valves, both of the Corliss and slide-valve type.

The cut shows a Class D Hall Air Compressor, with Cross Compound steam and Duplex air cylinders.

Standard Machines are provided with a combined speed and pressure governor and sizes above 9" diameter of steam cylinder can be fitted with adjustable Meyer Valve.



We wish to call special attention to our new

## HALL VOLUME REGULATOR FOR AIR COMPRESSORS

which represents a radical departure from present designs and combines simplicity, close pressure regulation and high mechanical efficiency at all loads.

It can be easily applied to almost any kind of air compressors with automatic inlet or outlet valves, or both, and makes it possible to control the amount of intake air, reducing the power required to operate the compressors in approximately the same proportion.

The amount of intake air can be regulated:

1. So as to correspond to the amount of compressed air consumed at any time, thereby keeping the receiver pressure constant.

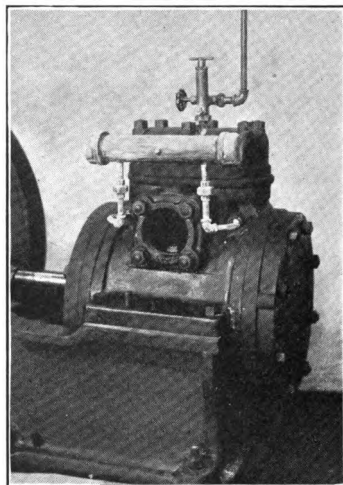
2. So as to vary with varying intake or discharge pressure, thereby keeping the power required to operate the compressor constant or utilizing the maximum output of the driving motor or engine.

3. So as to deliver any desired constant volume within the capacity of the compressor, or to fill almost any other requirement which the conditions of operation of an air or gas compressor may impose.

These results are not obtained in choking the intake air or by any other means involving waste of power and creation of high temperatures in the compressor cylinders.

Only a slight change of the suction or discharge valves is required to apply the Regulator to almost any type of existing air compressor at a very low cost. This can be done without interruption in the service of the compressor by making the changes on the spare set of suction or discharge valves.

The cut shows this regulator mounted on a Standard Hall Air Compressor with poppet valves. (Additional parts whitened to emphasize simplicity of equipment.)



## HALL STEAM PUMP COMPANY

### DUPLEX STEAM PUMPS

The Hall Duplex Steam Pump differs from all other duplex pumps in that it has a valve gear devoid of all levers, cranks, links and pins. There are only two moving parts on the steam end, the main piston and the valve piston, both of which are fitted with self-adjusting packing rings.

The action of the pump is that each steam piston acts as a slide valve, uncovering a port, thus admitting steam to move the valve piston on opposite side of pump. The valve is as sure to move as the piston itself and with ports properly located, one valve cannot be moved until the opposite piston has moved a predetermined

distance, and as the piston does not stop until after the other has commenced its stroke, the pump delivers a continuous uniform flow of water without shock, jar or intermittent pressure on delivery main.

This pump will always make its full stroke under all working conditions. For this reason, the Hall Pump is more efficient and has greater capacity, while owing to the simplicity of its valve gear, it can be run twice as fast as any lever pump, with but little wear and no danger.

**Class HA, Piston Pattern**, (illustrated) is for Standard Service or Boiler Feed for steam and water pressures up to 150 lbs. per square inch. Sizes from 6"x4"x6" to 22"x16"x24", capacities 38 to 2470 gallons per minute.

**Class HB, Plunger Pattern**, for Standard Service or Boiler Feed is built with end packed and center packed plungers in sizes from 6"x4"x6" to 22"x16"x24", capacities 38 to 2470 gallons per minute.

In addition to the above we build low service pumps of both types in any capacity up to 5000 gallons, single and duplex valve gear pumps, power pumps and steam driven crank and fly wheel pumps.

### CONDENSERS

The Hall Jet Condenser is built in the form of a vertical cylinder, the cooling water entering in thin streams at the top, while the wet vacuum pump removes the air and condensing water from the bottom.

The Hall Surface Condensers are built in form of a horizontal cylinder (carried by four vertical tubes) which also serve as connection pipes for the vacuum and circulating pumps.

The latter are usually of equal size and operated by a single steam cylinder located between them, on the same center line.

### VACUUM PUMPS

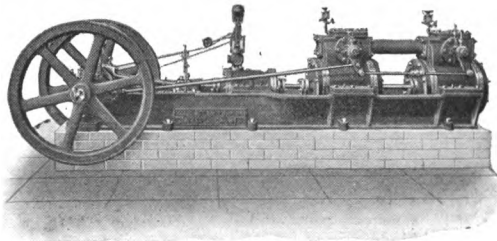
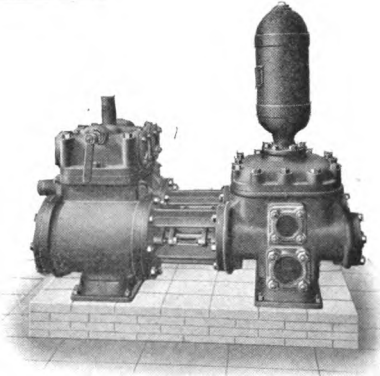
Our Dry Vacuum Pumps are built with crank and fly wheel and are of similar design as the Hall Air Compressors.

The valves are either positive moved of the slide-valve or Corliss type, or automatic of the balanced poppet or plate valve type, according to the conditions of the case or preference of the customer.

The Hall Volume Regulator can be applied to these machines as well in case it is desired to control the vacuum in any way.

The cut shows a **Class M, Hall Vacuum Pump, Dry system**, with steam driven tandem air cylinders, Corliss inlet valves and poppet type outlet valves.

*Write for our Catalogues.*

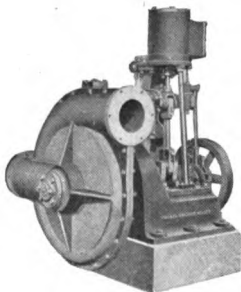


# MORRIS MACHINE WORKS

BALDWINVILLE, N. Y.

NEW YORK OFFICE: 39-41 CORTLANDT ST.

**BUILDERS OF CENTRIFUGAL PUMPING MACHINERY, HYDRAULIC DREDGES, STATIONARY AND MARINE ENGINES.**

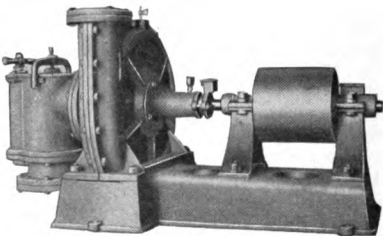


**Standard Double Suction Steam Pump.**

We build CENTRIFUGAL PUMPS for almost any service and of all types, including side suction and double suction, vertical or horizontal shaft. STAGE PUMPS for high heads. TWIN PUMPS for large capacities and high speeds. Or will design SPECIAL PUMPS to suit special conditions. As the oldest and largest firm in the country building exclusively this class of machinery, our experience of nearly fifty years has covered all services for which CENTRIFUGAL PUMPS have been used.

## MORRIS CENTRIFUGAL PUMPS

are perfectly balanced, require small space and foundation; have high efficiency; are equally suitable for small up to very large capacities, and can handle sand or solids with the water without injury. These pumps direct connected to reciprocating engines are suitable for moderate heads, or direct connected to electric motor or steam turbine (or belt driven) for high heads. For heads above 100 feet, pumps are preferably built in stages.



**Standard Horizontal Pump. Hand Suction Primer Attached.**

The Standard Horizontal Pump is the type most extensively used for all purposes and for general work is the best pump on the market. These pumps in iron construction are listed below. Specifications for pumps above 20-inch furnished on application.

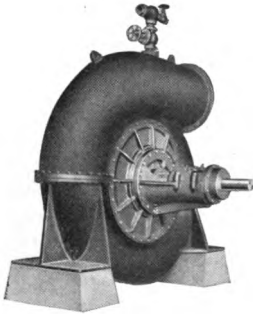
Write for new complete catalogue.

## MORRIS IMPROVED STANDARD IRON HORIZONTAL PUMP

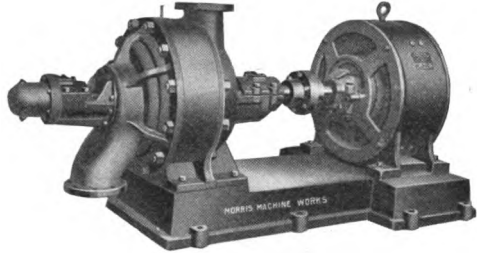
| No. Pump (Diameter Discharge Opening) | Size Pipe Flange on Suction, Inches | Economical Capacity, for each Gallon per Minute | Horse-Power Required Pulley, Foot Head | Diameter and Face of Pulley in Inches | Floor Space Required in Inches, Without Primer | Shipping Weight Without Primer, Lbs. | Shipping Weight With Primer, Lbs. | No. Pump |
|---------------------------------------|-------------------------------------|---|--|---------------------------------------|--|--------------------------------------|-----------------------------------|----------|
| 1                                     | 1 1/4                               | 30  | .025                                   | 4x 3 1/4                              | 12x 7  | 85                                   | ...                               | 1        |
| 1 1/2                                 | 2                                   | 70  | .058                                   | 6x 6                                  | 17x 31   | 175                                  | 220                               | 1 1/2    |
| 1 3/4                                 | 2                                   | 90  | .075                                   | 7x 8                                  | 21x 32   | 260                                  | 305                               | 1 3/4    |
| 2                                     | 3                                   | 120   | .10                                    | 8x 8                                  | 23x 37   | 350                                  | 415                               | 2        |
| 2 1/2                                 | 3                                   | 180   | .15                                    | 8x 8                                  | 24x 38   | 360                                  | 430                               | 2 1/2    |
| 3                                     | 4                                   | 260   | .22                                    | 8x 8                                  | 25x 39   | 415                                  | 495                               | 3        |
| 4                                     | 5                                   | 470   | .30                                    | 10x10                                 | 29x 41   | 615                                  | 720                               | 4        |
| 5                                     | 6                                   | 735   | .45                                    | 12x12                                 | 34x 54   | 940                                  | 1075                              | 5        |
| 6                                     | 8                                   | 1050  | .59                                    | 15x12                                 | 37x 55   | 1180                                 | 1345                              | 6        |
| 8                                     | 10                                  | 2000  | 1.00                                   | 20x12                                 | 45x 64   | 2065                                 | 2430                              | 8        |
| 10                                    | 12                                  | 3000  | 1.52                                   | 24x12                                 | 51x 69   | 2610                                 | 2940                              | 10       |
| 12                                    | 15                                  | 4200  | 2.00                                   | 30x14                                 | 63x 71   | 3615                                 | ...                               | 12       |
| 15                                    | 18                                  | 7000  | 3.50                                   | 40x15                                 | 77x 80   | 8250                                 | ...                               | 15       |
| 15*                                   | 18                                  | 7000  | 3.50                                   | 30x15                                 | 60x 68   | 3350                                 | ...                               | 15       |
| 18                                    | 20                                  | 10000   | 4.50                                   | 40x16                                 | 93x103   | 9000                                 | ...                               | 18       |
| 18*                                   | 20                                  | 10000   | 4.50                                   | 30x16                                 | 66x 72   | 5800                                 | ...                               | 18       |
| 20                                    | 22                                  | 12000   | 5.00                                   | 36x20                                 | 73x 83   | 7000                                 | ...                               | 20       |
| 24*                                   | 24                                  | 15000   | 5.50                                   | 48x36                                 | 94x137   | 10800                                | ...                               | 24       |

\* Refers to Low-Lift Pumps, which are recommended for heads up to 40 feet.

## MORRIS MACHINE WORKS



30" Side Suction Pump.



Eight Inch Two-stage High Pressure Pump. Direct Connected to Electric Motor.

When making inquiries for pumps, full information should be given—that is, quantity of water desired, head, including friction (or give actual elevation and length of suction and discharge piping), type of pump desired, how driven—whether belt, steam engine, electric motor (give electric current characteristics), arrangement of suction and discharge openings desired, whether right hand or left hand, etc.

### DREDGING PUMPS

MORRIS Dredging Pumps are made in sizes from 2" discharge and upward, built of cast iron or cast steel, both lined and unlined. They are belt driven or direct connected to steam engines. For the sake of economy 15-inch and larger dredging pumps are usually directly connected to compound or triple expansion steam engines. We have also many dredging pumps in service directly connected to electric motors. We can furnish pumps only or the complete dredge, including all machinery.



20" HYDRAULIC DREDGE with 750 H. P. MORRIS Triple Expansion Engine, Water Tube Boilers, Cutter Machinery. This Size Dredge Has an Average Capacity of 250,000 Cubic Yards of Material per Month.

### STEAM ENGINES

We also build a very complete line of STATIONARY AND MARINE ENGINES, in single cylinder, compound and triple expansion types.

## WILLIAM E. QUIMBY, INC.

122 S. MICHIGAN AVE.  
CHICAGO, ILL.

548 WEST 23RD STREET  
NEW YORK

MANUFACTURERS OF QUIMBY ELECTRIC PUMPS

### QUIMBY SCREW PUMPS

In the Quimby Screw Pump, four screws mounted in pairs on parallel shafts, act as pistons in propelling the water. There is no end thrust of the screws in their bearings, because the back pressure of the column of liquid is delivered to the middle of the cylinder and the end wise pressure upon the screws in one direction is exactly counterbalanced by a like pressure in the opposite direction.

**Simplicity**—These pumps have no valves, no internal packing and no small moving parts. The working parts are comprised in two moving pieces.

**Efficiency**—Have a very high efficiency against a wide range of pressure.

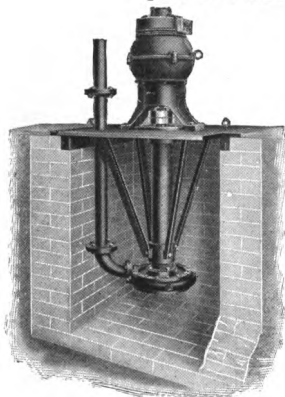
**No Pulsation and No Hammer**—Action of the screws on the liquid is continuous and the delivery is free from pulsations which cause hammering in pipes.

**Maintenance and Durability**—Power is applied direct. Have no internal packing that must be frequently replaced. Thrust is perfectly balanced. The absence of rubbing surfaces and consequent absence of internal friction gives these pumps great durability.

**SIZES:** Quimby Screw Pumps are made in standard sizes from 30 to 3,000 gallons per minute for maximum pressure of 120 pounds per square inch and from 30 to 575 gallons per minute for maximum pressure of 175 pounds per square inch. Larger pumps and pumps for higher pressures are built to order.

**APPLICATIONS:** **Electric Pumps**—As a rotary pump, the Quimby Pump is an ideal one for direct-connected electric work. Owing to the continuous flow drive of the screws these pumps have a large capacity in a small space. As **House Service, Elevator, Oil Refinery and Brine-Circulating Pumps**, the Quimby Pumps have advantages peculiar to themselves, among them being absolutely pulseless delivery, automatic, noiseless, little attention and small repair work required.

### QUIMBY SUMP, BILGE AND SEWAGE PUMPS



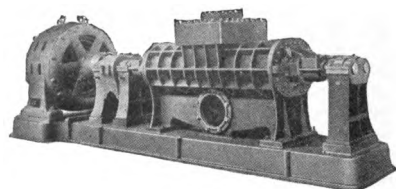
Submerged Sump Pump

**Quimby Sump Pumps** are heavily built, always ready for service, automatic and easily accessible in all parts. Bearing which carries the impeller and vertical shaft is situated at the level of the sump pit cover instead of being at the pump and thus underneath the gritty water.

**Quimby Bilge Pumps** are mounted on round cast-iron covers for bilge tanks of various sizes and kinds. They are the simplest possible pumps occupying minimum space, operate automatically and can be relied upon to work when wanted.

Both **Bilge and Sump Pumps** are built in stock sizes from 30 to 250 gallons per minute.

**Sewage Pumps**—We have made a study of this problem for many years, having installed sewage pumps in private houses, office buildings and hospitals. Centrifugal pumps to handle sewage should be especially designed for that work and we are glad to answer questions and submit estimates.



2,800 Gallons Per Minute Oil Pump

We publish a very complete catalogue which answers in detail the usual questions regarding Electric Pumps. We are glad to send this catalogue on request. If you do not find the Electric Pump you are looking for described in this catalogue please write us. We probably make it, but if not, we will help you find it.

## D'OLIER CENTRIFUGAL PUMP AND MACHINE COMPANY

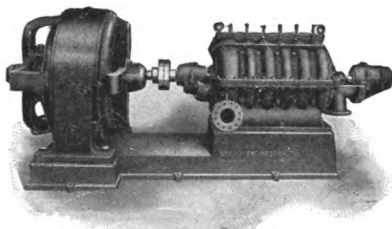
MORRIS BUILDING  
PHILADELPHIA, PENNA

**D'OLIER CENTRIFUGAL VOLUTE AND TURBINE PUMPS**  
FOR WATER WORKS AND IRRIGATION, FIRE SERVICE, BOILER FEED, MINE DRAIN-  
AGE, CONDENSER SUPPLY, SEWAGE, FILTRATION SYSTEMS,  
HYDRAULIC MINING, AND GENERAL SERVICE

Pumps carefully designed and  
built for particular service required.

Complete Pumping and Power  
Plants installed.

We manufacture only a high  
grade, high efficiency pump, using  
the best grade of materials through-  
out. The impellers are accurately  
designed and carefully finished,  
thereby insuring maximum effi-  
ciency.



6"-6 Stage D'Olier Turbine Pump.  
700 G. P. M. at 700 ft. total head

### D'OLIER CENTRIFUGAL MACHINES

For sugar, chemicals, sewage, oil and waste reclaiming, clarifying and filtering  
and textile work. Belted, electric motor or steam turbine driven. *Special*  
*Centrifugals, especially those for extreme High Speeds, designed and built.*



Electric Centrifugals

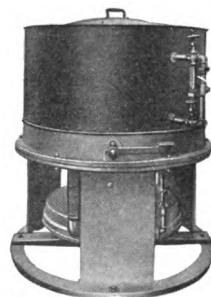
**STANDARD ELECTRIC CENTRIFUGALS**  
"D'Olier Improved Weston" type with ball bearings  
—single non-adjustable buffer and unit steel supporting  
framing. Designed for heavy duty and highest efficiency.  
For sugar work, textile, chemicals, etc.—a strictly high  
grade machine of rugged construction.

### D'OLIER COMBINED OIL EXTRACTING AND WASHING CENTRIFUGALS

Improved "Weston self-balancing" type machines  
for separating and reclaiming oil from wiping waste,  
machinery wiping towels, rags, etc.

Washing and drying waste, towels and other ma-  
terials.

Recovering oil from automatic machined parts,  
metal chips, turnings and scrap, and like economic uses.



"D'Olier Improved Wes-  
ton" Type Combined Oil  
Extracting and Washing  
Centrifugal

### APPARATUS FOR SEWAGE TREATMENT AND UTILIZATION OF TRADE WASTES

Riensch-Wurl screens and highly efficient apparatus and equipment for  
Mechanical Treatment of sewage and recovery of by-products.

*D'Olier Sludge Reduction Machines*  
and

*Specially designed centrifugals for purging  
sludge and screenings.*

*Pumps for Sewage and Sludge*

*Apparatus for the recovery of Sludge values  
Send for Bulletins*

## **R. D. WOOD & COMPANY**

PHILADELPHIA, PA.

**ENGINEERS, IRON FOUNDERS, MACHINISTS:—WATER AND GAS WORKS APPLIANCES, AND PUMPING MACHINERY; CAST IRON PIPE; GAS HOLDERS, PURIFIERS, CONDENSERS, COAL GAS PLANTS; HYDRAULIC TOOLS AND MACHINERY, PUMPING ENGINES, CENTRIFUGAL PUMPS; GAS PRODUCERS, GAS PRODUCER PLANTS FOR POWER, FUEL AND METALLURGICAL PURPOSES, THEISEN WASHERS; GENERAL MACHINERY, LARGE LOAM CASTINGS; SUGAR HOUSE APPARATUS; VALVES AND HYDRANTS.**

### **CAST IRON PIPE**

Bell and Spigot Pipe from 1 inch to 84 inches in diameter, Flange, Special deep bell, High Pressure, Flexible joint for Submarine Work, Standard and Special Fittings, Heavy Loam and Dry Sand Castings.



### **PUMPING ENGINES**

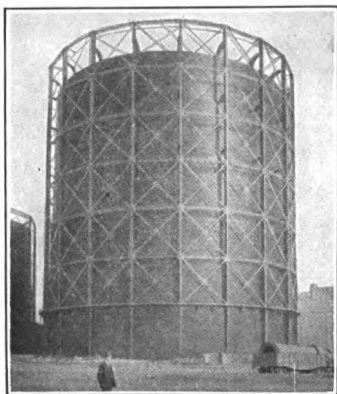
Vertical Triple Expansion, and Direct Acting for Water Works, Sewage, Irrigation and for high pressures. High duty pumping engines of both the crank and fly wheel and direct-acting types. Designed to combine highest economic duty and efficiency with greatest reliability and utmost simplicity.

Estimates and drawings (either exact or preliminary) furnished upon application, with statement of requirements to be fulfilled.

### **CENTRIFUGAL PUMPS**

For Water Works, High Pressure Fire Systems, Irrigation Reclamation, Dredging, Sewage, etc.

Superior in Design—High Efficiency—Reliable Service.



Gas Holders—Single or Multiple Lift—any Capacity.

Heavy Tank and Plate Work.

Purifiers, Scrubbers, Condensers, Gas Works Appliances.

Coal Gas Plants.

Bench Work, Center Seals.

Gas Valves.



## **R. D. WOOD & COMPANY**

### **HYDRAULIC MACHINERY**

Hydraulic Presses of every description for the heaviest work, Steam Hydraulic Forging Presses, Punches, Shears, Riveters, Intensifiers, Hoists, Pressure Pumps, Cranes, Valves, etc., etc. For the majority of operations to which hydraulic power can be applied, and especially those requiring very great force exerted through a comparatively short stroke, as in riveting, punching, shearing, lifting, forging and flanging, there is no other system at all comparable with it for efficiency, uniformity, simplicity or economy. This is true for several reasons; primarily in that there is absolutely no motion or power consumed except in the act and at the moment of performing the desired operation.

### **HYDRAULIC VALVES**

#### **Hydraulic Operating Valves, Check, Foot, Stop and Shock Relief Valves**

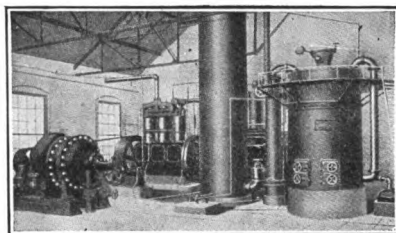
A high grade valve is an essential to the satisfactory operation of hydraulic machinery.

We are building a patented type of operating valve which is giving excellent service. We have also a special line of Check, Foot, Stop and Shock Relief Valves.

### **PRODUCER GAS PLANTS**

We have had years of experience in the building of producers for all kinds of fuel purposes as well as for power, and our customers may be certain of securing apparatus suitable to their requirements both from an economic and operating standpoint.

Our engineering department is at your service, and we would be pleased to have our representative visit your plant and give full details.



### **GAS WASHERS**

We control for the United States the Theisen Gas Washing Process, which we build for producer and blast furnace gas. This Process was adopted by the United States Steel Company at Gary, and is being put in with all their new construction. It delivers the gas to an engine cleaner than the air in the mixture.

### **GENERAL MACHINERY**

Our shops are well equipped for building large machinery of every description, such as sugar, chemical and similar work.

### **IRON CASTINGS**

We are especially well equipped for making large and intricate loam castings; also castings in dry sand and green sand.

### **HYDRANTS AND VALVES**

Fire Hydrants, Mathews patents for standard and high pressure. Gate, Check, Foot and Air Valves, Valve Boxes, Indicator Posts, Foot Valve and Intake Screens, Hood Racks, etc.

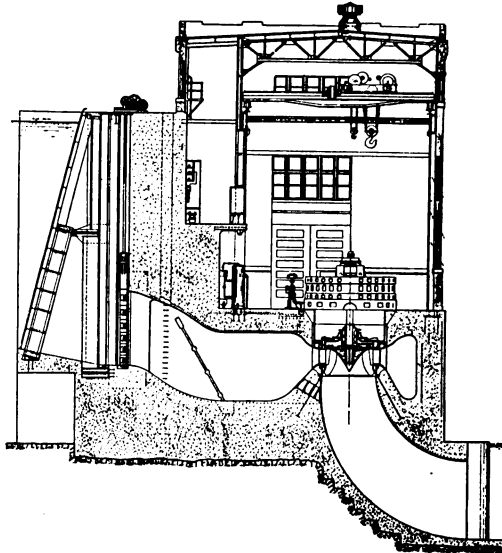
# I. P. MORRIS COMPANY

HYDRAULIC DEPARTMENT

PHILADELPHIA, PA.

**SPECIALISTS IN THE DESIGN AND CONSTRUCTION OF HIGH CLASS, HIGH POWER AND HIGH EFFICIENCY HYDRAULIC TURBINES.**

Cross section through one 6,000 horse-power turbine in Development No. 2 Power House, Appalachian Power Company, Virginia. Total equipment furnished this Company consists of seven turbines with I. P. Morris governors. Careful efficiency tests made by the Consulting Engineers of the Power Company, Messrs. Viele, Blackwell & Buck show the average of the maximum efficiencies of two of the units to be 93.7%, clearly indicating the advisability of using the single runner, vertical shaft turbine for low heads.



Among the contracts for turbines of this type recently awarded to the I. P. Morris Company may be mentioned:

|   |  |
|---|--|
| Appalachian Power Company,<br>New River, Va.                          | { Station No. 2. 4—6,000 H.P. Turbines<br>Head 49 feet, Speed 116 R.P.M. |
| Mississippi River Power Company,<br>Keokuk, Iowa                      | { Station No. 4. 3—3,500 H.P. Turbines<br>Head 34 feet, Speed 95 R.P.M.  |
| J. G. White & Co.,<br>Stevens Creek Development, Georgia              | { 8—10,000 H.P. Turbines<br>Head 32 feet, Speed 57.7 R.P.M.              |
| Alabama Power Company,<br>Coosa River, Alabama                        | { 5—3,125 H.P. Turbines<br>Head 27 feet, Speed 75 R.P.M.                 |
| Cedar Rapids Mfg. & Pr. Co.,<br>St. Lawrence River, Canada            | { 4—17,500 H.P. Turbines<br>Head 68 feet, Speed 100 R.P.M.               |
| Laurentide Company, Ltd.,<br>Grand Mere, P. Q., Canada                | { 9—10,800 H.P. Turbines<br>Head 30 feet, Speed 55.6 R.P.M.              |
| Northern Ontario Light & Power Co.,<br>Fountain Falls, Cobalt, Canada | { 3—1,500 H.P. Turbines<br>Head 30 feet, Speed 150 R.P.M.                |
| Turner Falls Company,<br>Turner Falls, Mass.                          | { 6—20,000 H.P. Turbines<br>Head 76 feet, Speed 120 R.P.M.               |
| Pennsylvania Water & Power Co.,<br>McCall Ferry, Pa.                  | { 2—1,500 H.P. Turbines<br>Head 30 feet, Speed 150 R.P.M.                |
|   | { 3—9,700 H.P. Turbines<br>Head 54 feet, Speed 97.3 R.P.M.               |
|   | { 1—16,500 H.P. Turbine<br>Head 63 feet, Speed 94 R.P.M.                 |

Total capacity of turbines built or under construction by I. P. Morris Company, 1,670,000 horse-power, of which turbines aggregating 472,700 horse-power are of the type illustrated above.

## AMERICAN PROCESS COMPANY

68 WILLIAM STREET, NEW YORK

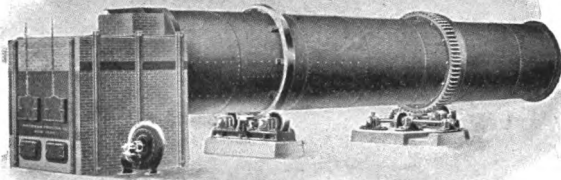
**MANUFACTURERS OF DRYERS, PRESSES, DIGESTERS, COOKERS AND SPECIAL MACHINERY; COMPLETE PLANTS DESIGNED AND EQUIPPED**

### AMERICAN PROCESS MACHINERY

The distinguishing features of all the machinery introduced by the American Process Company and which puts it in a class by itself, is its automatism, continuity and uniformity of action. With an American Process machine the product is absolutely uniform, labor is reduced to practically nothing, and as the machine is not subject to the wear and tear of starting, stopping and reversing or otherwise changing the load, its life easily outlasts any similar type.

#### DIRECT HEAT ROTARY BLAST DRYER

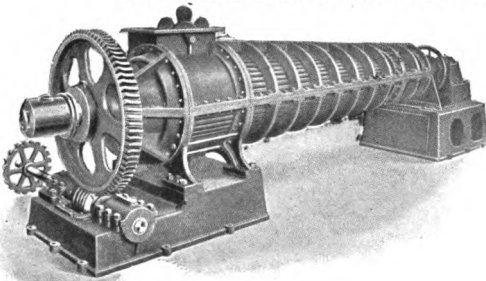
The American Process Direct Heat Dryer is of the direct heat and direct contact type. It consists essentially of a cylindrical steel shell, provided on the interior with longitudinal shelves. Near each end of shell is a weldless rolled steel tire which rests on carefully chilled and



ground friction roller wheels. These wheels are rotated by gearing or chain belting, and they in turn impart rotation to the shell. The Dryer as a whole is set on a gentle slope, determined and fixed by experience.

Operation—The wet material and the furnace gases enter the shell at the higher end. The wet material falls to the bottom of the Dryer, is caught by a shelf, elevated to almost the highest point of the rotation, and is then showered through the furnace gases. This cycle of operations is repeated until the material, in a dried condition, is discharged from the lower end of the Dryer. The material and furnace gases travel in the same direction with the highest temperature in contact with the wettest material.

#### AUTOMATIC CONTINUOUS SCREW PRESS



The American Process Press is of a continuous screw type and consists of a horizontal tapered screw built up on a hollow, perforated shaft arranged so as to allow of admitting steam to the material if desired. The screw fits closely inside of a similarly tapered, slatted curb and rotates. The gradual decrease in size of the screw and its curb causes the pressure.

Operation—From a hopper or chute the material enters the feeder, is mechanically measured, and forced into the straight, purely conveyor portion of the screw. The screw carries it into the tapered curb where it is slowly and positively pressed. The material is continually fed in at one end and discharged at the other. The liquids are forced out between the slats, and into drainage holes of shaft and are conducted to a tank.

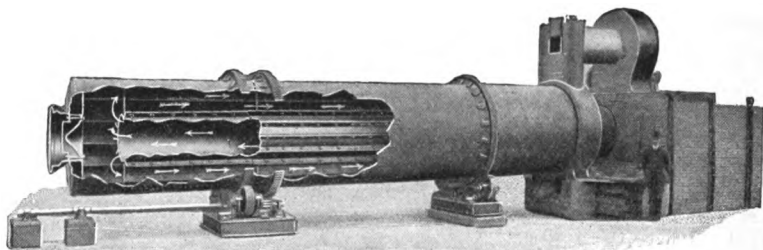
The American Process Company manufactures special Direct Heat and Steam Heated Air Dryers, Coolers, Digesters, Presses and Condensers, of various sizes, to meet any and all conditions. Let us know your requirements and we will advise you what we recommend for your purpose.

## RUGGLES-COLES ENGINEERING CO.

McCORMICK BLDG.  
CHICAGO

50 CHURCH STREET  
NEW YORK CITY

**BUILDERS OF RUGGLES-COLES "DOUBLE SHELL" DRYERS, CONSULTING AND CONTRACTING ENGINEERS, DESIGNERS AND BUILDERS OF SPECIAL MACHINERY.**



Section of Ruggles-Coles Dryer Showing Direction of Gases

### RUGGLES-COLES "Double Shell" DRYERS

We build Ruggles-Coles "Double-Shell" Dryers for drying a large variety of inorganic and organic materials. For this work we have perfected six regular types of dryers, but for certain substances we build special dryers to order. After fifteen years' successful experience we know that the Ruggles-Coles Dryer is designed on the correct principle and point to more than 400 satisfactory installations in all parts of the world as evidence of its superiority.

**Class "A" Dryer.**—The principle of the Ruggles-Coles "Double-Shell" Dryer is that the material being dried passes the hot gases in the opposite direction to their travel. The Class "A" dryer consists of two concentric shells rigidly connected at the center. Between this point and each end are two sets of swinging arms allowing for unavoidable expansions and contractions. The inner cylinder at the head or feed end is connected with the furnace by a flue lined with fire brick. At the discharge end is a revolving head on the inside of which are lifting buckets, so that the material is delivered out through the central casting. The machine has sixteen bearings, thus distributing the load and eliminating danger of hot journals. The furnace is independent of the machine and located in a convenient place, although generally placed close to the head of the dryer.

The heated air passes through the inner cylinder and returns between the outer and inner cylinders to the fan, passing on the way the material to be dried. By reason of the inclination and revolution of the dryer the material is carried to the discharge end. This dryer is especially suitable for drying cement rock, clay, coal, ores, sand, gypsum, fullers earth, peat, sewage sludge, tankage, etc., etc.

**Class "B" Dryer.**—For materials which cannot be dried by direct heat on account of the danger from ignition or injury of the materials by furnace gases, we build a dryer similar in all respects to the Class "A" machine except the gases are taken from the inner flue and returned through a number of tubes, so that it does not come into direct contact with the material being dried.

**Class "E" Dryer.**—For drying nitrate of soda and other fusible salts which are not injured by direct heat but which cannot be dried in a rotary dryer, on account of the material adhering to the shell, we build a special dryer which has the advantage of direct heat with positive feed and delivery.

**Class "F" Dryer.**—When the quantity of material to be dried is small or the amount of moisture to be evaporated is slight, we build a dryer of single shell construction, and while not as economical in fuel cost as our Class "A" dryer is much lower in first cost.

## J. P. DEVINE COMPANY

BUFFALO, N. Y.

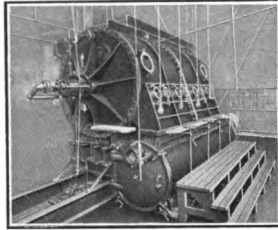
**MANUFACTURERS OF VACUUM DRYING & EVAPORATING APPARATUS**

### VACUUM DRUM DRYERS

**For Dyewood and Tanning Extracts, Milk and Food Products, Pastes, etc.**

A rapid and uniform drying is effected because the drum dips into the solution and takes up a thin film of the wet material of 1-125 of an inch and less. The water is evaporated from the material at a temperature of from 117° F. to 96° F. according to the Vacuum in the apparatus of 26 $\frac{3}{4}$ " to 28 $\frac{1}{4}$ ".

The drying process is continuous and independent of climatic conditions; free from dust and consequent elimination of danger to health of employees and destruction of property; and at a minimum cost of operation, including labor.



Vacuum Drum Dryer

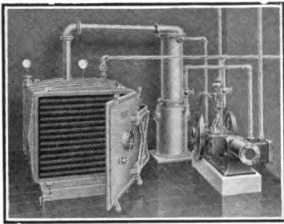
### VACUUM CHAMBER DRYERS

**For Colors, Dyes, Extracts, Salts, Rubber, Smokeless Powder and High Explosives, and other Chemical and Food Products.**

The Vacuum Drying Chamber is designed to remove the water rapidly and at a low temperature from materials which cannot be dried by methods used heretofore without altering their chemical composition on account of their sensitiveness to heat. It may also be used with great saving in time, fuel, cost of plant, and working expenses for other substances where a low temperature is not an absolute necessity.

Materials which are difficult to dry in the atmosphere or which cannot be dried at all in the atmosphere without decomposition have all

moisture removed from them in a very short time in the vacuum chamber without danger of impairing their qualities by overheating.



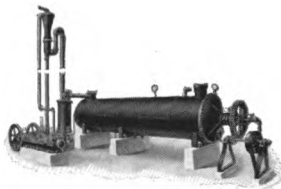
Cast-Iron Vacuum Drying Chamber with Surface Condenser and Vacuum Pump

### VACUUM ROTARY DRYERS

**For Starch, Granular Substances, and Chemical By-Products.**

The moist material is conveyed by an elevator into a hopper high above the manhole to facilitate the charging of the apparatus. After charging, the manhole is closed and a high vacuum produced by means of an air pump, the vapors passing into the condenser.

Concentric with the steam jacketed outside cylinder is a revolving inside drum, heated by live or exhaust steam, to which stirring blades are attached. The material to be dried is between the inside drum and the outside cylinder and is kept in constant motion by the stirring blades. Thus every particle comes into close contact periodically with the heating surfaces, and a very thorough and even drying process results.



Rotary Vacuum Drying Apparatus

**VACUUM PUMPS** of highest efficiency and of non-corrosive metals.

**VACUUM PANS** for any requirement and capacity in single or multiple effect.

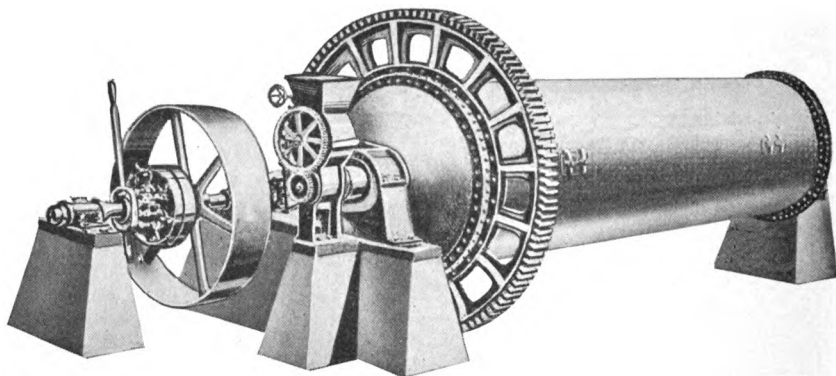
**CONDENSERS, AIR COMPRESSORS, AIR FILTERS, ETC.**

**Over 3,000 Installations in Daily Operation**

## WEST PULVERIZING MACHINE CO.

220 BROADWAY, NEW YORK

**PATENTEES AND MANUFACTURERS OF TUBE MILLS, DRYERS, CRUSHERS AND PULVERIZERS FOR ALL MATERIALS. ENGINEERS, MACHINISTS, FOUNDERS AND PATTERN MAKERS. STEEL PLATE WORK. PRESSES AND DIES. RUBBER ROLLS. ROTARY CUTTERS. FLINT PEBBLES AND LINING. PORCELAIN BALLS AND LINING.**



Complete Plants designed and installed for manufacturing:

|                                 |               |
|---------------------------------|---------------|
| Cement                          | Silica        |
| Talc                            | Feld Spar     |
| Soapstone                       | Enamel        |
| Pyrophyllite                    | Sienna        |
| Graphite                        | Stove Polish  |
| Carbon                          | Flint         |
| Kaolin                          | Baking Powder |
| Guayule                         | Asbestine     |
| Clay                            | Soap Powder   |
| Aniline Colors                  | Halloysite    |
| Licorice                        | Paints        |
| Barite                          | Rutile        |
| Fullers Earth                   | Mica          |
| Glass Sand                      | Ochres        |
| Infusorial Earth                | Face Powders  |
| Oxides                          | Umber         |
| Tripoli                         | Drugs, etc.   |
| Quartz                          | Agalmatolite  |
| And all minerals and materials. | Albite        |

## PENNSYLVANIA CRUSHER CO.

STEPHEN GIRARD BLD'G, PHILADELPHIA, PA.

NEW YORK, 50 Church Street

PITTSBURGH, Machesney Bld'g

**COAL CRUSHING & CLEANING MACHINERY FOR COKING PLANTS. SWING-HAMMER CRUSHERS, BRADFORD COAL CLEANERS, ROTARY AND JAW CRUSHERS, SINGLE ROLL CRUSHERS, GRINDING PANS, DELAMATER "FLOAT & SINK" TESTERS.**

### "PENNSYLVANIA" BRADFORD COAL CLEANERS

For Coke Plants, Coal Washeries, Power Houses, &c.

In addition to its distinct advantages as a Crusher, this machine has the remarkable ability to *automatically* remove impurities such as slate, bone, sulphur balls or binder from bituminous steam and coking coals, thereby reducing the objectionable ash and sulphur.

It is used extensively in preparing R.O.M. coals in By-Product and Bee-Hive Coking plants, Coal Washeries, &c.

In connection with its crushing and cleaning functions for R.O.M. coal for *large Power Houses*, the "Pennsylvania" Bradford is most efficient in removing stray iron, coupling pins, mine props and all sorts of impediments that damage Conveyors, Stokers and other Power House machinery.

For Coal Washeries and Stoker-feed it crushes R.O.M. *with less fines than Rolls or any other type.*

Absolutely automatic in operation, low horse-power, runs 12 to 15 R.P.M., requires no labor to operate, other than occasional oiling. Is practically "fool-proof."

### "PENNSYLVANIA" SWING-HAMMER CRUSHERS

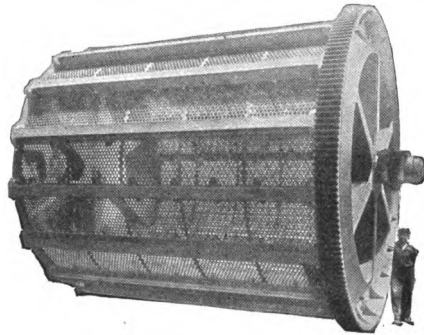
Extensively used for pulverizing bituminous Coals in By-Product and Bee-Hive Coking Plants, for crushing Cement Rocks and Limestones in Cement Mills, for Lime, Shales, Chemicals and a multitude of other materials.

Main frame of fabricated Steel practically immune from breakage. Removable Steel Wear-Liners, "Ball & Socket" Bearings, 6, 8 and 10 rows of Hammers, large diameter Steel Discs, quick adjustable Grinding Cage. Built in capacities 3 tons to 400 tons hourly. By weight the "Pennsylvania" is more than 90% steel.

### "PENNSYLVANIA" SINGLE ROLL CRUSHERS

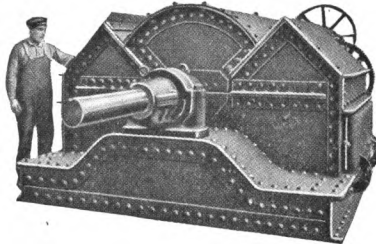
For coarse and moderately fine crushing of coal, coke, lime, limestone, fire clays, shales, phosphate rock, chemicals, etc. Excellent for Stoker-feed.

**Features:** 1. Big reduction of large lumps in ONE operation. 2. Fed from bin, car, grab-bucket or steam shovel—no mechanical feeder. 3. Can't be choked by overfeed—different from 2-roll Crusher. 4. Roll won't spread no matter how heavily fed. 5—Can be started with hopper full. 6. Automatic safety device. 7. Readily adjustable for varying sizes of crushing. 8. Wear parts quickly accessible. 9. Slow speed—35 to 40 R.P.M. 10. Easy on Horse Power. 11. Several sizes, ruggedly built, simple design. 12. Very economical of headroom. 13. Low upkeep and installation. 14. No changing pitch-diameters.



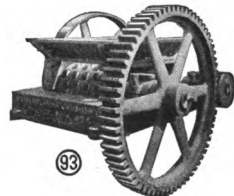
(Patented)

Bradford Coal Cleaner



(Patented)

Hammer Crushers



93

# WILLIAMS PATENT CRUSHER AND PULVERIZER CO.

OLD COLONY BLDG., CHICAGO

WORKS

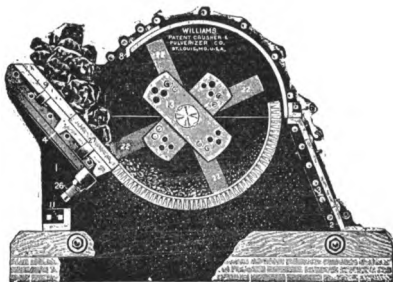
St. Louis

BRANCH OFFICES

NEW YORK SAN FRANCISCO PHILADELPHIA PITTSBURGH

**MANUFACTURERS OF CRUSHING AND GRINDING MACHINERY**

**COAL CRUSHERS FOR COKE OVEN WORK, BY-PRODUCT AND BEEHIVE OVENS**



By the use of the Williams Patent Hammer Crushers with the various adjustable features, the following results are obtained from the ovens: The oven pulls easier, more coke is made from each oven, the ash is reduced, the coke comes out firm, regular in size, does not crumble, and the structure is much improved.

The substantial construction of these machines is plainly shown in this cut; all parts subject to wear are easily adjustable, which includes the hammers, the discs, the cage bars, and the breaker plates. The housing is entirely protected from wear by heavy liner plates made of heavy chilled iron. The machine is very accessible, as it is made of sectional construction.

## Specifications Regular Crusher

| Size Mill            | Hopper Opening | Size Feed   | Capacity Tons Per Hour |              |              | Speed    | Size Pulley |      | Extreme Dimensions |       |       | Horse Power | Wght  |
|----------------------|----------------|-------------|------------------------|--------------|--------------|----------|-------------|------|--------------------|-------|-------|-------------|-------|
|                      | In.            |             | 1/2" & finer           | 1/4" & finer | 1/8" & finer | R. P. M. | Diam.       | Face | L'gth              | Wdth  | H'ght |             | P'nds |
| 1                    | 15x12          | Run of Mine | 30- 40                 | 25- 30       | 20- 25       | 1000     | 20"         | 15"  | 6'                 | 6'6"  | 3'9"  | 20-25       | 6500  |
| 2                    | 20x12          |             | 45- 55                 | 40- 50       | 30- 40       | 1000     | 20"         | 15"  | 6'                 | 7'6"  | 3'9"  | 30-35       | 7500  |
| 3                    | 30x16          |             | 65- 80                 | 60- 70       | 45- 60       | 1000     | 20"         | 15"  | 6'                 | 8'6"  | 3'9"  | 50-60       | 9500  |
| 4                    | 40x18          |             | 100-115                | 80- 90       | 60- 80       | 1000     | 24"         | 18"  | 6'                 | 9'0"  | 3'9"  | 75-80       | 10500 |
| 5                    | 50x20          |             | 120-140                | 100-110      | 75-100       | 1000     | 24"         | 20"  | 6'                 | 9'6"  | 3'9"  | 100         | 12000 |
| 6                    | 60x20          |             | 150-175                | 115-130      | 100-120      | 1000     | 24"         | 22"  | 6'                 | 11'0" | 3'9"  | 125         | 13500 |
| Jumbo Specifications |                |             |                        |              |              |          |             |      |                    |       |       |             |       |
| 5                    | 30x24          | R.O.M.      | 150-175                | 120-140      | 80-100       | 750      | 24"         | 18"  | 8'10"              | 9'    | 5'4"  | 85-100      | 20000 |
| 6                    | 36x24          |             | 180-200                | 145-165      | 120-140      | 750      | 30"         | 20"  | 8'10"              | 10'   | 5'4"  | 140-150     | 24000 |
| 7                    | 48x30          |             | 225-250                | 200-220      | 150-175      | 750      | 30"         | 24"  | 8'10"              | 11'   | 5'4"  | 165-185     | 28000 |
| 8                    | 60x30          |             | 275-300                | 250-275      | 180-200      | 750      | 30"         | 24"  | 8'10"              | 13'   | 5'4"  | 200-250     | 30000 |

## CRUSHERS FOR ANTHRACITE MINE REFUSE

Our Patent Hinged Hammer Debris Crushers are in extensive use for properly crushing and treating Anthracite debris or Culm before flushing it into the mines.

## CRUSHERS FOR CHAIN GRATES OR STOKERS

The Williams Patent Coal Splitter takes Run of Mine Coal and reduces the same to 1 1/2", 1 1/4", 1", 3/4" and finer with the "minimum amount of fine dust," the only machine made that can be regulated to properly size coal. All parts are adjustable to wear; the crusher is also adjustable to give most any size coal desired.

## Brief Specifications

| No. of Crusher | Hopper Opening, Inches | Weight | Horse Power | Capacity—Tons Per Hour R.O.M. to 1 1/2" and Finer |
|----------------|------------------------|--------|-------------|---|
| 1              | 15x12                  | 6,500  | 15 to 20    | 25 to 40  |
| 2              | 20x12                  | 7,200  | 20 to 25    | 50 to 60  |
| 3              | 30x16                  | 9,500  | 40 to 50    | 75 to 100   |
| 4              | 40x18                  | 10,500 | 60 to 75    | 100 to 125  |
| 5              | 50x20                  | 12,000 | 85 to 100   | 135 to 175  |
| 6              | 60x20                  | 13,500 | 100 to 125  | 180 to 220  |

We also crush Coal and Pitch for Briquette Plants—for Coal Washers, before and after washing, and make a specialty of sizing Coal for all Commercial Purposes.



# WILLIAMS PATENT CRUSHER AND PULVERIZER CO.

## RAW MATERIAL GRINDERS FOR CEMENT AND GYPSUM PLANTS

### Universal Mill

This *Universal Grinder* is the *only* machine of its kind made. Will take DRY 2" Limestone, Shale, Clay, or Coal, and deliver at one operation a product 95% through 20 mesh, TUBE MILL FEED WITHOUT OUTSIDE SCREENS OR SEPARATORS. No other machine can deliver the fine uniform product year in and out.



### COMPLETE SPECIFICATIONS UNIVERSAL MILLS

| Size<br>Mill | Size<br>Feed | Diam.<br>Mill | Capacity<br>Per Hour |         | Speed    | Horse<br>Power | Floor Space<br>Extreme<br>Dimensions |        |        | Size<br>Pulley |       | W'ght |
|--------------|--------------|---------------|----------------------|---------|----------|----------------|--------------------------------------|--------|--------|----------------|-------|-------|
|              |              |               | Dry                  | Stone   |          |                | L'gth                                | Width  | Height | Face           | Diam. |       |
|              |              |               | 12 Mesh              | 20 Mesh | R. P. M. |                |                                      |        |        |                |       |       |
| 0            | 1 "          | 18"           | ¾                    | ½       | 1800     | 10-12          | 5'                                   | 5' 1"  | 3' 2"  | 8 ½"           | 8"    | 2500  |
| 1            | 1 ½"         | 26"           | 2-4                  | 1-3     | 1600     | 15-20          | 6' 3"                                | 5' 10" | 3' 8"  | 10 ½"          | 16"   | 4000  |
| 2            | 1 ½"         | 26"           | 5-6                  | 3-5     | 1600     | 20-25          | 6' 3"                                | 6' 3"  | 3' 8"  | 12 ½"          | 16"   | 5000  |
| 2xx          | 2 "          | 26"           | 6-8                  | 5-6     | 1600     | 30-35          | 6' 3"                                | 7'     | 3' 8"  | 15 "           | 20"   | 6500  |
| 3            | 2 "          | 40"           | 10-12                | 8-10    | 1100     | 50-60          | 7' 6"                                | 6' 10" | 5' 4"  | 15 "           | 20"   | 12000 |
| 4            | 2 ½"         | 40"           | 13-15                | 10-13   | 1100     | 65-75          | 7' 6"                                | 7' 10" | 5' 4"  | 18 "           | 20"   | 14000 |
| 5            | 2 ½"         | 40"           | 16-20                | 15-18   | 1100     | 80-100         | 7' 6"                                | 8' 6"  | 5' 4"  | 20 "           | 20"   | 16500 |
| 9            | 3 "          | 60"           | 25-35                | 20-30   | 750      | 150-175        | 12'                                  | 9' 2"  | 7' 2"  | 24 "           | 30"   | 30000 |

### Vulcanite Re-Crusher

These Vulcanite grinders will take raw material, limestone, shale, clay or coal, in cubes of 3 inches and under, and reduce the same to 1/2 inch or 1/4 inch. This makes an excellent feed for those plants which use roller mills as finishers in the raw end.

### VULCANITE SPECIFICATIONS

| Size Mill | Hopper Opening | Size Feed | Capacity Tons per Hour |    |    | R. P. M. | Horse Power | Extreme Dimensions |       |        | Size Pulley |      | W'ght |
|-----------|----------------|-----------|------------------------|----|----|----------|-------------|--------------------|-------|--------|-------------|------|-------|
|           |                |           | ½"                     | ¾" | 1" |          |             | L'gth              | Width | Height | Diam.       | Face |       |
| 1         | 14"x 5"        | 1½"       | 4                      | 3  | 2  | 1500     | 15-18       | 4'8"               | 6'3"  | 3'3"   | 16"         | 10½" | 4200  |
| 2         | 18"x 6"        | 2 "       | 7                      | 5  | 3  | 1500     | 20-25       | 4'8"               | 6'6"  | 3'3"   | 16"         | 12½" | 5000  |
| 2xx       | 24"x 6"        | 2 "       | 10                     | 8  | 6  | 1500     | 30-35       | 4'8"               | 7'    | 3'3"   | 20"         | 15 " | 6000  |
| 3         | 18"x 8"        | 2½"       | 20                     | 18 | 15 | 1000     | 40-50       | 5'2"               | 7'    | 4'     | 20"         | 15 " | 10000 |
| 4         | 24"x 8"        | 3 "       | 30                     | 27 | 25 | 1000     | 70-75       | 5'2"               | 7'4"  | 4'     | 20"         | 18 " | 12000 |
| 5         | 30"x 8"        | 3 "       | 35                     | 30 | 28 | 1000     | 90-100      | 5'2"               | 8'    | 4'     | 20"         | 20 " | 14000 |
| 6         | 36"x 10"       | 3 "       | 40                     | 35 | 30 | 1000     | 110-125     | 5'2"               | 9'    | 4'     | 20"         | 22 " | 15500 |
| 7         | 40"x 10"       | 3 "       | 50                     | 42 | 35 | 1000     | 125-150     | 5'2"               | 9'6"  | 4'     | 22"         | 24 " | 17500 |

We issue the following catalogs:

Coal Crusher Catalog—For all those crushing and grinding coal, etc.  
 Cement and Limestone Catalog—Limestone, Gypsum and Similar Grinders.  
 Fertilizer Catalog—Bone, Tankage, Shells and Fertilizer Work.  
 Clay Catalog—Clay, Shale, etc., for Brick, Tile and Terra Cotta.  
 Oil Cake Catalog—Linseed, Cottonseed and Similar Oil Cake Grinders.  
 Shredder Catalog—Bark, Chips, Cork and all Fibrous Materials.  
 Stock Food Catalog—All Cereals for Feed Millers, Alfalfa, etc.

Mention material you wish to crush or grind and we shall see that you receive the proper catalog and specifications.

# THE DORR CYANIDE MACHINERY CO. DENVER, COLORADO

EASTERN OFFICE  
30 Church St., New York

LONDON OFFICE  
17 South St., London, E. C.

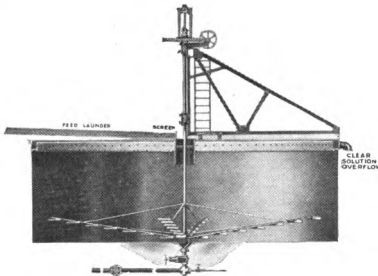
## ENGINEERS

### THE DORR CLASSIFIER, WASHER OR DESLIMER THE DORR THICKENER OR DEWATERER

These machines are used in a number of industries where washing, dewatering or mixing has to be done.

#### THE DORR CLASSIFIER

By means of this machine a practically perfect separation of sandy and slimy materials can be effected, the rakes removing the sand as it settles and the liquid and slime overflowing. The machine has many applications in a number of industries, such as removing sand from Kaolin pulp, washing sand used in glass grinding and moulding, washing phosphate sands to remove clay, etc. The machine has particular advantages in the flexibility of products produced and extremely low cost of operation and upkeep.



The Dorr Thickener—Patented

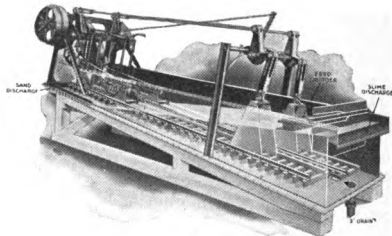
eral of these machines, the overflow from each being fed to the next one. In this way a practically perfect classification can be made and the different sized materials drawn continuously from the bottoms of the several tanks.

#### THE DORR AGITATOR

Where it is imperative that all the solids are kept evenly in suspension all the time this machine gives absolutely successful results—thirty mesh sand and such heavy materials as iron concentrates are easily handled in continuous work. Any settled solids are brought to the centre by means of the arms carrying plow blades. The airlift in the central column raises the pulp and distributes it by means of the revolving launders attached to a head at the top of the column over the pulp in the tank. Absolute reliability avoiding the use of centrifugal pumps or other wearing parts. Operating costs lower than those of any other Agitator.

Any of these machines are built acid-proof.

*Descriptive catalogue and full engineering data sent on request.*



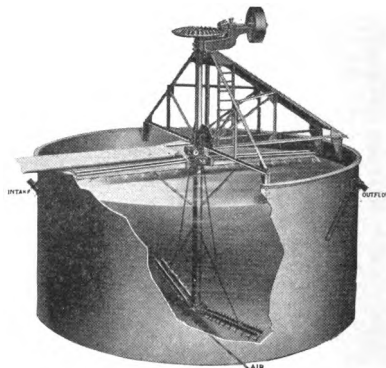
The Dorr Classifier—Patented

#### THE DORR THICKENER

Fine material suspended in any quantity of liquid can be fed to this machine, a clear overflow obtained and a thick pulp drawn continuously from the bottom. Continuous Counter-Current washing using these machines obviates excessive dilution as well as the use of filters.

In the clay, paint pigment, sewage disposal and a number of other industries this machine offers great advantages over intermittent dewatering and collecting.

Where a fine product suspended in liquid has to be graded into several sizes the pulp can be run through several of these machines, the overflow from each being fed to the next one. In this way a practically perfect classification can be made and the different sized materials drawn continuously from the bottoms of the several tanks.



The Dorr Agitator—Patented

## AUTOMATIC WEIGHING MACHINE CO.

MAIN OFFICE AND FACTORY

134-140 COMMERCE STREET, NEWARK, N. J.

### AGENCIES

28 Woodbridge St., EAST DETROIT, MICH.  
P. O. Box 3613, WINNIPEG, MANITOBA, CAN.

819 American Trust Bldg., CLEVELAND, O.  
Federal St. & River Ave., N. S., PITTSBURGH, PA.  
Cable Address:—AWMCO

### AUTOMATIC WEIGHING, PACKING AND SEALING MACHINERY

Adapted to the Use of Manufacturers and Packers of Sugar, Coffee, Spice, Snuff, Washing Powder, Baking Powder, Starch, Seeds, Cereals, Grains, Flour, Wheat, Rolled Oats, Salt, Fertilizers, Cotton Seed, Cotton Seed Meal, Limestone and Shale, Clinker and Gypsum, Coal, Etc.

### TO ENGINEERS

We have a line of automatic weighing, packing and conveying machinery unequalled for *speed*, *accuracy*, and *durability*. Nothing would please us better than an opportunity to show you the direct and simple technical devices by which we secure both precision and continuous uninterrupted performance.

### TO MANUFACTURERS

Ask us what can be done in the way of automatically handling your materials, raw or in manufacturing process, and after examination we will submit proposals that take advantage of all favorable conditions.

We outline a portion of our products in the following:

**Mill, Elevator and Brewery Automatic Grain Scales**—These machines belong to the type of "Net Weight" Scales, and are used for grains and all free flowing materials. Made in various sizes, adapted to the work required. Speed, 4 to 10 weighings per min.

**Power Feed Upright Bagging Scale**—Weighs directly into the sack. Designed to handle materials such as Raw Sugar, sticky Fertilizers, etc. Equipped with a self-contained feed. Capacity 50 to 200 lbs. Speed 3 bags and upward per min.

**Small Package Automatic Scale**—For whole Coffee, Hominy, Rice, Split Peas, Farina, Wheat, etc. Speed 20 to 25—1 lb. discharge per min. Capacity from 10 ounces to 2½ lbs.

**Net Weight Automatic Scales**—Material is weighed in the scale bucket and then discharged into a receptacle. This is the only true method of securing the actual desired weight of material, as all receptacles, whether of tin or cardboard, vary considerably in weight.

**Carton Sealing**—Special features: most economical disposition of floor space; entire absence of air and steam lines; shortest time consumption when changing from one size carton to another; entire absence of rapidly moving parts; all flaps folded when stationary.

Guaranteed to seal 25 to 30 tight packages per minute. The complete outfit consists of a bottom sealer and a top sealer, connected with a suitable conveyor.

**Coal Automatic Scales**—Made in various sizes corresponding to work.

**Clinker Automatic Scales**—Designed especially for the handling of Clinker.

**Clinker and Gypsum Automatic Tandem Scales**—Provide means for adding exactly the required amount of Gypsum to Clinker in the making of Portland Cement. Clinker Machine will weigh from 190 to 400 lbs. and the Gypsum scale from 5 to 15 lbs.

**Rock and Clay Automatic Tandem Scales**—Primarily designed for weighing raw materials used in the manufacture of cement. Can be used for any materials that need proportioning for a mix. Made in all sizes and so connected together that each waits until the other has received the designated quantity, when they dump together. These machines have been installed in gangs of two or three. The Power Trip used is the most positive trip on the market.

## M. D. KNOWLTON CO.

Main Office and Works

24 ELIZABETH ST., ROCHESTER, N. Y., U. S. A.

NEW YORK

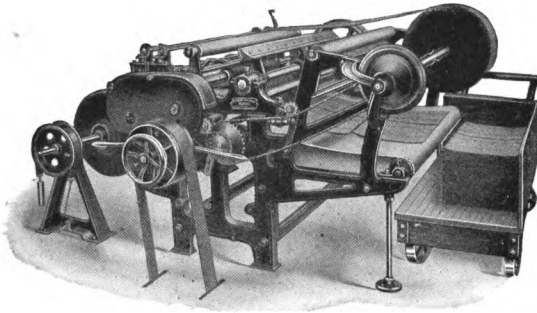
LONDON

CHICAGO

### BUILDERS OF PAPER BOX AND FIBRE CASE MACHINERY

#### MACHINES FOR CUTTING, TREATING AND FORMING PAPER, BOARD, SHEET FABRICS AND SHEET METALS

Our experience in designing and making machines for this class of work extends over a period of thirty years. Our shop facilities are excellent. Many of the machines we manufacture are necessary to other industries as well as to that of the paper box. Below is only a partial list of the standard and automatic machines we manufacture and carry in stock. We solicit inquiries for standard and special machinery of this class.



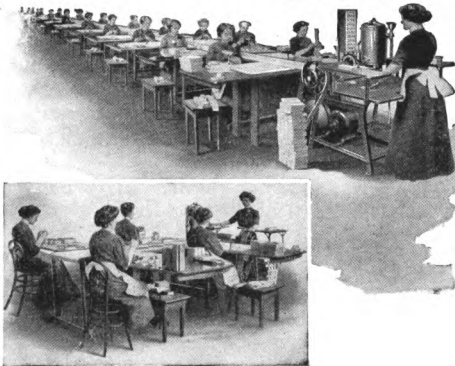
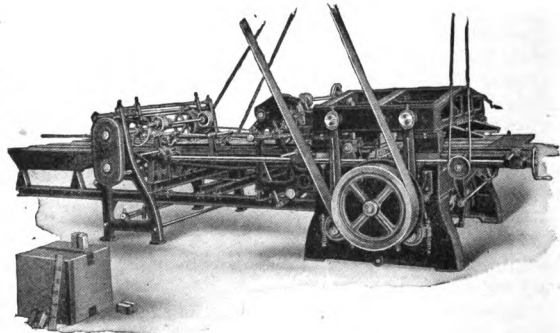
#### CUTTING MACHINES

for Slitting, Sheeting or Shape Cutting Paper, Pulp, Fibre or Corrugated Board, Sheet Fabrics and Sheet Metals.

Scorers and Slitters  
Corner Cutters  
Slotters and Flap Cutters  
Roll Sheet Cutters

#### FORMING MACHINES

for Creasing, Bending and Shaping Paper and Cardboard.  
Automatic Creasers and Slotters  
Folding Box Creasers  
Flange Benders  
Corner Stayers  
Tape Stayers  
Covering Machines  
Topping Machines



#### TREATING MACHINES

for Coating Paper and Cardboard with Glue, Silicate of Soda, Paste and other Liquid Solutions.

Automatic Gumming Machines

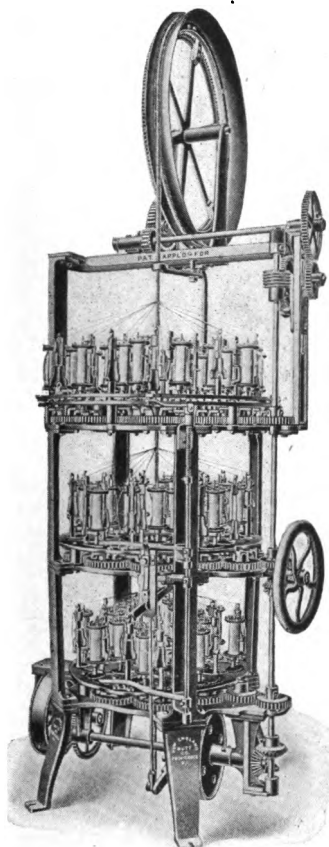
Sheet Gluers  
Flange Gluers  
Paraffine Coaters  
Silicate of Soda Coaters  
Glue Cookers and Mixers  
Glue Pots

## NEW ENGLAND BUTT COMPANY

PROVIDENCE, R. I.

European Agents: Selson Engineering Company, Ltd., London, England

**MANUFACTURERS OF BRAIDING MACHINERY, MACHINERY FOR  
INSULATING WIRES AND CABLES, WIRE ROPE MACHINERY**



**Triple Deck 16x20x24.  
No. 1 Cable Braider.**

Taping Machinery for taping wires or cables with paper or other materials.  
Polishing Machines, for insulated wires and cables from the small sizes up to 3" cables.

Wire Measuring Machines.

Twinning Machines.

Rubber Strip Covering Machines, for applying rubber insulation to wires and cables with either single or double seam. These machines are built in several sizes and handle from one up to twenty wires at a time.

### BRAIDING MACHINERY

#### American and German Type

Used for making plain and fancy braids for dress trimmings and millinery, round and flat shoe laces, soutache braids, candle wicking, tapes, cords, banding, clothes lines, fish lines, packing, gas tubing and rubber hose, round and flat elastic.

Sash Cord Braiders for making solid sash and curtain cord of various sizes.

Sash Cord Finishers for polishing solid sash cord.

Silk Covering Machines for covering cotton with silk.

Braid Spooling and Measuring Machines.

Rubber Spreading Machines, built of any desired width for applying a thin coating of rubber to cloth.

### INSULATING MACHINERY

#### Single, Double and Triple Deck Braiders.

These are made in all sizes and combinations for covering wires from small sizes up to large cables.

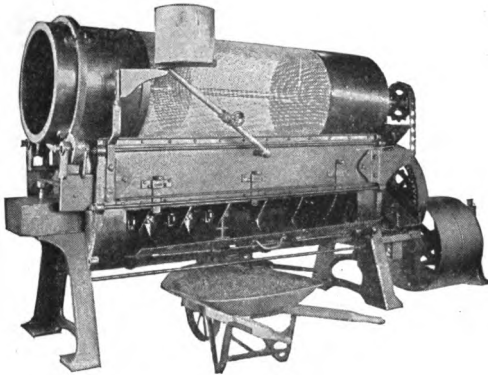
Magnet Wire Machinery for silk and cotton covering arranged to handle round and flat wires.

Annunciator Wire Winders, Single, Double or Triple Deck.

## STANDARD SAND & MACHINE CO.

CLEVELAND, OHIO, U. S. A.

**BUILDERS OF SAND HANDLING MACHINERY—MIXERS, ELEVATORS  
CONVEYORS, DRYERS AND BONDING MACHINES**

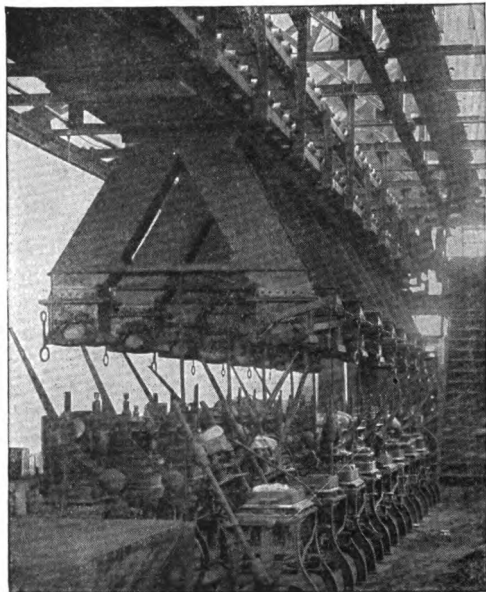


**Standard Batch Mixers**

These **BATCH MIXERS** for **Core and Facing Sands** are built in five sizes with capacities of 4, 6, 7½, 9 and 27 cubic feet per batch. They cut over and mix the sand from 90 to 120 times a minute. For large capacity, the large sizes should be equipped with floor hopper and bucket elevator in order to save shoveling. These mixers riddle, temper and mix the sands in one continuous operation and may be emptied directly

into car. The rolling and bonding machines are built in four sizes. The largest size is made especially for steel sand.

The **DRAG CONVEYOR** is the most successful device for delivering prepared sand to molders or to molding machines. Down spouts are used wherever desired and may be either single or double. This cut, which is taken from the Ford Company's Plant at Detroit, shows double spouts delivering sand to a double row of molding machines. The belt conveyor is used to return the shaken out sand back to the mixer from which it is elevated to the drag conveyor again ready for use.



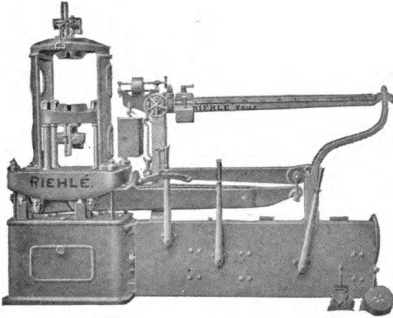
**Standard Drag Conveyor**

# RIEHLÉ BROS. TESTING MACHINE CO.

1424 N. NINTH STREET, PHILADELPHIA, PA.

## TESTING MACHINES AND TESTING APPLIANCES

We are the oldest and largest Testing Machine manufacturers in the United States. Established nearly 50 years ago. The Riehlé Testing Machines are used by the leading Colleges, Steel and Iron Works, United States Government, many foreign Governments, and are recommended by many of the most prominent and successful Engineers throughout the world. We design and build these machines from 5000 lbs. to 1,000,000 lbs. and over in capacity for the determination of any physical property.



Riehlé U. S. Standard Vertical Screw-Power Testing Machine. Three Screw Type, 100,000 Lbs. Capacity

### Features of Riehlé Testing Machines

Designed Right.  
Plenty Strong Enough.  
No Sparing of Material.  
Long Base Lines.  
Simple in Construction.  
All Parts Accessible, without taking whole machine apart.  
Fine Finish. Attractive in Appearance.

### NOTE

We are now building all the Riehlé Vertical Screw Power-Testing Machines with two (2), three (3), or four (4) Main Pulling Screws as may be desired.

For quick and convenient reference our complete line of Testing Machines is catalogued as enumerated below:

#### RIEHLÉ TESTING MACHINE CATALOGUE "A"

Illustrating and describing all the larger Riehlé U. S. Standard Testing Machines, Screw and Hydraulic Power, also new and ingenious tools for same; Machines for Long Transverse Members, Torsional and Impact Testing, also Calibrating Levers.

#### RIEHLÉ CATALOGUE "AA" OF EXTENSOMETERS, COMPRESSOMETERS, AND TORSION METERS.

Containing illustrations and descriptions of the very latest and best Riehlé Extensometers, etc.

#### RIEHLÉ TESTING MACHINE CATALOGUE "B"

Embracing all the various styles of Riehlé U. S. Standard Testers for Wire, Cloth, Canvas, Cord, Twine and Textile Fabrics of all kinds, also for every variety of test. This Catalogue is well worth your careful perusal.

#### RIEHLÉ CHAIN TESTING MACHINE CATALOGUE "C"

In this Catalogue is found all that is *newest and best* in Testing Machinery for Chain, Wire, Hemp, Rope, Eye-Bars, Bridge Irons, etc. Special Machines for different forms of materials can be designed along these lines. We also furnish Hydraulic Pumps separately if desired. We claim these Machines are the Strongest and Best in the World.

#### RIEHLÉ TESTING MACHINE CATALOGUE "D"

Containing illustrations of Transverse, Bending, and Special Testing Machines, Rope Twist-ers, Loam Mills, Pipe Provers, etc.

Every Foundry and Machine Shop should install some of the articles shown in this Catalogue.

#### RIEHLÉ TESTING MACHINE CATALOGUE "E"

Those interested in Machines for testing Springs of all kinds, also Oils and Bearing Metals, are specially referred to this Catalogue for all the newest and best Machines.

#### RIEHLÉ CATALOGUE "F"

In this Catalogue are presented illustrations and descriptions of superior designs and patterns of Hand and Power Hydraulic Pumps and Presses, also Riehlé-Robie Patented Screw Jacks, etc.

#### RIEHLÉ CEMENT-TESTING MACHINE CATALOGUE "G"

In this Catalogue one will find "everything that is good" in the way of testing Cements, Asphalts, Building Material, and also every conceivable article for thoroughly equipping a Physical Testing Laboratory for that kind of work. Be sure and send for this Catalogue.

#### RIEHLÉ ROAD MATERIALS TESTING MACHINE CATALOGUE "K"

In this Catalogue you will find illustrations of everything to make tests of Road Materials, as used by the United States Government, Department of Public Roads, Washington, D. C.

Select the CATALOGUES you want when ready to order.

## L. O. KOVEN & BROTHER

OFFICE—50 Cliff Street, New York City

FACTORY—JERSEY CITY, N. J.

**ENGINEERS, MANUFACTURERS, MACHINISTS AND DESIGNERS.  
FABRICATED PLATE STEEL, COPPER, BRASS, TIN, ALUMINUM,  
ETC., OF ANY SHAPE. DESIGNERS OF SPECIAL APPARATUS FOR  
MANUFACTURING INDUSTRIES.**

We are prepared to do plate work of every description for Ships, Mills, Mines, Factories, Plantations, Chemical Works, Paint Works, Paper Mills, Abattoirs, Fertilizer Plants, Water Works, Government Work, Sewage Systems, etc. We also make and design Special Apparatus and Machinery to meet the progress in all lines of business. **WE HAVE THE FACILITIES FOR IMPROVING YOURS.**

### **A Partial List of What We Make**

|                          |                                 |
|--------------------------|---------------------------------|
| Autoclaves               | Jacketed Tanks                  |
| Bottle Sterilizers       | Kilns                           |
| Bread Racks              | Lead Lined Tanks                |
| Can Washers              | Malt Tanks                      |
| Canned Goods Sterilizers | Metal Melting Furnaces          |
| Cheese Vats              | Mixers                          |
| China Kilns              | Mufflers                        |
| Coil Boilers             | Oil Filters                     |
| Condensed Milk Coolers   | Oyster Washers                  |
| Copper Tanks             | Percolators                     |
| Copper Lined Steel Tanks | Pie Racks                       |
| Creosoting Tanks         | Pipe (Riveted)                  |
| Drying Apparatus         | Plating Tanks                   |
| Exhaust Manifolds        | Sand Blast Tanks                |
| Extractors               | Steam Kettles                   |
| Galvanized Tanks         | Sterilizers                     |
| Gasoline Tanks           | Stills                          |
| Gasometers               | Smoke Stacks                    |
| Glass Kilns              | Tanks (Air, Gas, Oil and Water) |
| Glue Dissolvers          | Tumblers                        |
| Gum Washers              | Vacuum Pans                     |
| Ham Boilers              | Varnish Tanks                   |
| Hot Water Tanks          | Vulcanizers                     |
| Humidifiers              | Water Stills                    |



## DOVER BOILER WORKS

50 CHURCH ST., NEW YORK

Works: DOVER, N. J.

STEEL PLATE AND STRUCTURAL STEEL CONSTRUCTION



Penstock 6 Feet in Diameter Built for J. E. Henry & Sons,  
Lincoln, N. H.

We produce the classes of work in which we specialize at a lower cost than most of our competitors. Our advanced methods of management and high efficiency are some of the reasons.

Stacks

Tanks

Flues

Hoppers

Bins

General Factory

Requirements

Standpipes

Penstocks

Pipe Lines

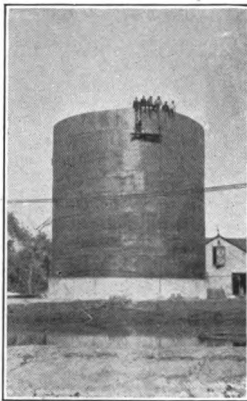
Equipment for

Sugar Plantations

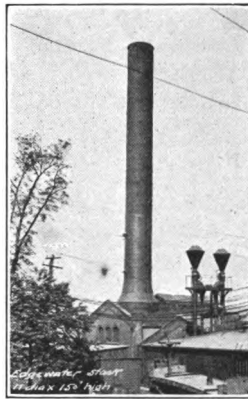
Hydraulic Power Stations

Blast Furnaces, Etc.

### Steel Buildings



Standpipe 44' Diameter by 44' High, Stack 11' Diameter by 150' High.  
-Built for Standard Bleachery,  
Carlton Hill, N. Y.

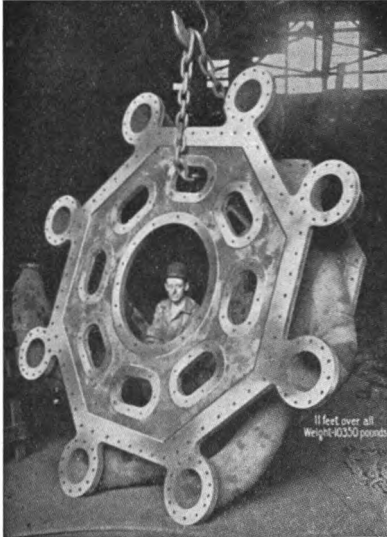


*Builders of Big Stacks and Tanks.*

## THE MARSHALL FOUNDRY CO.

PITTSBURGH, PA.

INGOT MOLDS AND GREY IRON CASTINGS



Capacity 250 tons per day.

### INGOT MOLDS

made from remelted standard Bessemer pig iron.

### GREY IRON CASTINGS

for all purposes—10 lbs. to 40,000 lbs.

We make a specialty of LARGE CASTINGS such as:— OPEN HEARTH  
BESSEMER STEEL WORKS and BLAST FURNACE CASTINGS,  
BELLS HOPPERS EXTENSIONS TROUGHS  
HEARTH JACKETS COOLING PLATES  
FURNACE RUNNERS BLOW PIPES SOAKING PIT COVERS  
CINDER LADLES POTS COLUMNS, ETC.

|                         |            |               |
|-------------------------|------------|---------------|
| SPECIAL CASTINGS        | CONDENSERS | PIPE SECTIONS |
| SPECIAL EXHAUST OUTLETS |            | SCREENS       |
| CHEMICAL POTS           | STILLS     | PANS, ETC.    |

—for—

CHEMICAL, SOAP, GLYCERINE, SUGAR, PAINT, VARNISH, and  
BY-PRODUCT COKE WORKS.

### STRUCTURAL CAST IRON

Columns, Bases, Treads, Sills, Lintels, Guards, Floor Plates, Etc.

### INGOT MOLDS—SOLID OR SPLIT

All kinds and sizes, for Bessemer, Open Hearth, or Crucible Steel.

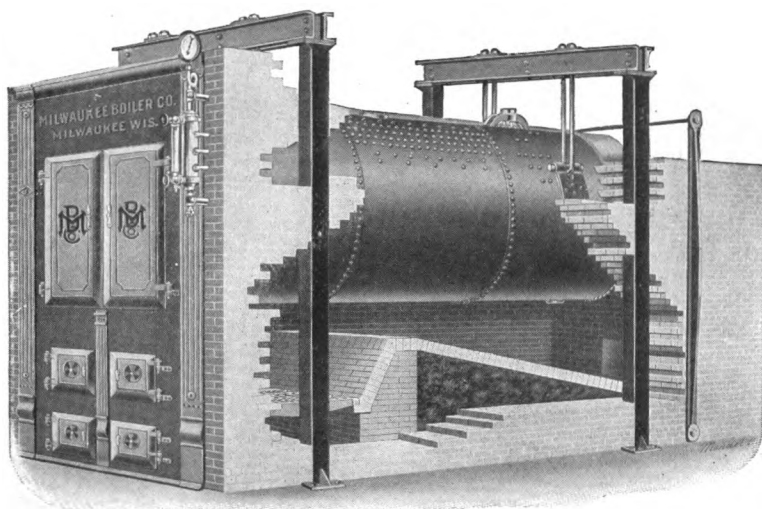
We have on hand PATTERNS and EQUIPMENT for all sizes used in general mill work.

Ask for quotation before placing your orders for molds.

## MILWAUKEE BOILER COMPANY

220 OREGON ST., MILWAUKEE, WIS.

**WE ARE PREPARED TO FURNISH ANYTHING IN STEEL PLATE CONSTRUCTION FOR BEET SUGAR REFINERIES, PAPER MILLS, OIL REFINERIES, SOAP FACTORIES, WOOD ALCOHOL AND TURPENTINE PLANTS, TANKS (FOR STORAGE OR PRESSURE) WITH RIVETED SEAMS, PENSTOCKS, RIVETED PIPE FOR HYDRAULIC AND STEAM PRESSURE, EXHAUST PIPES, STEAM HEADERS, EXHAUST HEATERS, BRICK HARDENING CYLINDERS, GALVANIZING POTS, RETORTS, STILLs, AGITATORS, STEAM PANS AND JACKET KETTLES.**



**Milwaukee high pressure horizontal tubular boiler with full front and suspension setting**

We manufacture power boilers designed for working pressures of 100, 125 and 150 pounds. Every detail of construction has been carefully considered and every precaution taken to secure efficiency, safety and durability.

Both during construction and after completion, rigid inspection and test assure that the highest standards are maintained.

Our engineering and estimating department is at your disposal to assist you in designing any article required in our line.

We are prepared to quote favorable prices on Rendering Tanks, Self Supporting Stacks, Riveted Pipe, Gas Purifiers, Water Jackets, Coal Hoppers, and other articles of similar construction.

We carry a large stock consisting of plates, sheets, tubes, rivets, bars and flanges. This enables us to make prompt shipment of all orders.

This stock includes castings of all kinds for boiler setting, also a full supply of valves and gauges.

## STRUTHERS-WELLS COMPANY

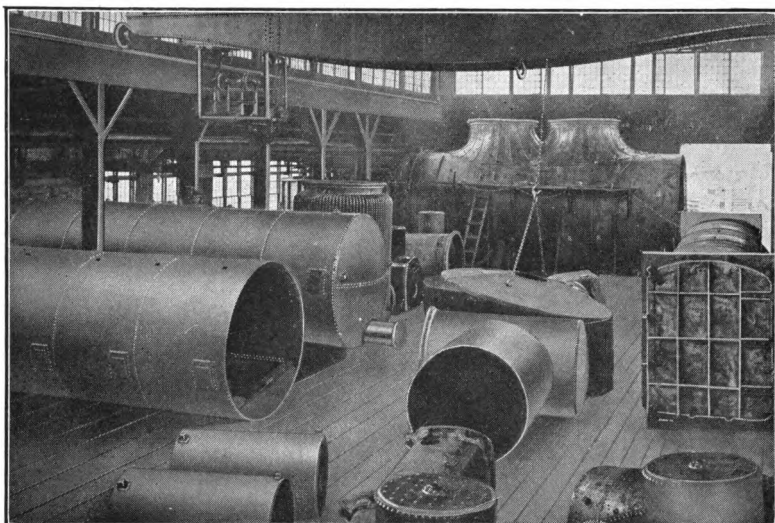
Established 1851

WARREN, PENNSYLVANIA

NEW YORK OFFICE, 50 Church St.

### RIVETED AND WELDED STEEL PLATE CONSTRUCTION

Anything in Steel Plate Construction for Beet Sugar Refineries, Paper Mills, Oil Refineries, Soap Factories, Wood Alcohol and Turpentine Plants, Tanks (for Storage or Pressure) with either Welded or Riveted Seams. Penstocks, Riveted Pipe for Hydraulic and Steam Pressure, Exhaust Pipes, Steam Headers, Exhaust Heaters, Brick Hardening Cylinders, Galvanizing Pots, Retorts, Stills, Agitators, Steam Pans, and Jacketed Kettles.



View of one corner of Erecting Floor

We will contract to furnish specially designed work in steel plate from customers' plans and specifications, either completely built up in the shop or assembled, knocked down and shipped in sections as may be called for.

Our equipment and experience enable us to handle both intricate and simple work with equal ease and dispatch. Our workmanship will pass the most rigid inspection.

We maintain a fully equipped estimating department at our shops and also at our New York Office. This enables us to furnish prices promptly.

If you want a specially designed piece of work, send us your drawings and specifications,—we have probably built it before, or at least something very similar to it.

Smoke breechings, stacks and air flues for modern buildings are right in our line.

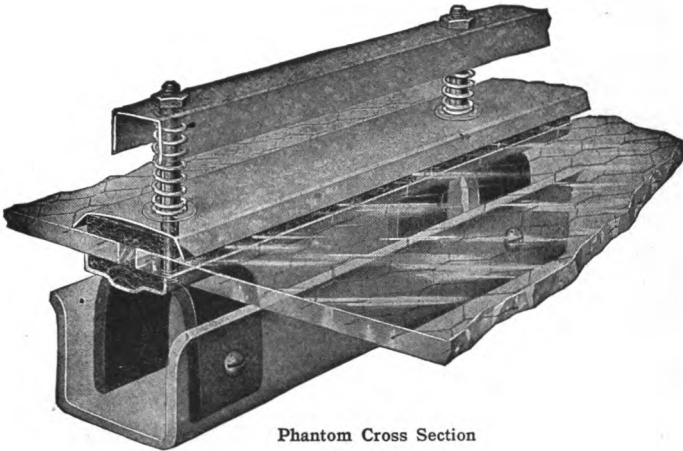
# THE G. DROUVÉ COMPANY

## BRIDGEPORT, CONN.

Telephone Connections  
Western Union Code

BRANCH OFFICE  
180 N. Dearborn St., CHICAGO, ILL.

### "ANTI-PLUVIUS" PUTTYLESS SKYLIGHT & SASH OPERATING DEVICES



#### "ANTI-PLUVIUS" PUTTYLESS SKYLIGHT

Trade Marked and Patented

The "Anti-Pluvius" Skylight is weather-proof. It can be furnished in any type and will be found to be a permanent construction. The glass is bedded on cow-hair felt which provides a cushion resting surface to take up shock, vibration or expansion and contraction. The weight of a man on the bridge is carried through to the supporting channels below without contact with or pressure on the glass. Each light is independent of every other and does not come in contact with metal, thus doing away with condensation from sweating. Manufacturers in general are gradually replacing old and worn out skylights with the "Anti-Pluvius," thereby establishing a standard and doing away with much crackage and breakage of glass. Other information furnished on request, together with estimates.

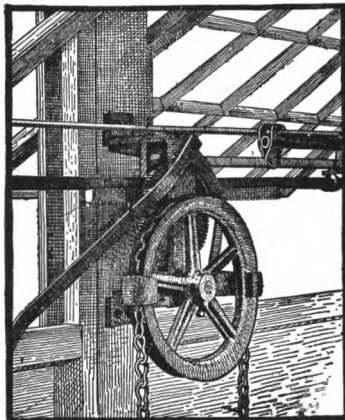
#### "STRAIGHT-PUSH" SASH OPERATOR

The "Straight-Push" Sash Operator operates any number of sash positively, quickly, and with individual power applied to each sash. A rack and pinion moving a line of  $\frac{3}{4}$ " pipe, supported by brackets, backwards and forwards, is the guiding principle, and a push or pull is secured instead of torsion.

The main guide lever-arms are of  $\frac{1}{2}$ " steel. The supporting brackets are formed of  $\frac{1}{2}$ " steel with cast-iron spools on bearing shafts of phosphor bronze. The operating wheel has cut-steel gears with steel shaft controlling a cut-steel rack and pinion. The few connections are made with phosphor bronze washers between to prevent these parts rusting together.

A one-man control gives sufficient power to operate lines of sash 100, 200 or more lineal feet.

Full information on request.



Straight-Push Sash Operator  
Patented

# DURAND STEEL LOCKER COMPANY

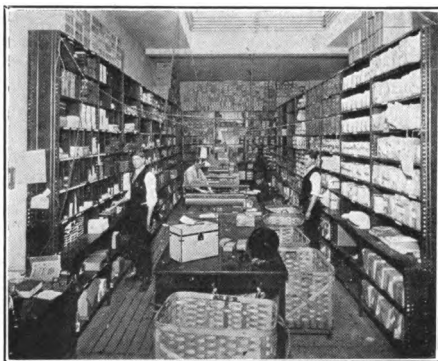
76 WEST MONROE ST., CHICAGO, ILL.

NEW YORK OFFICE  
132 Nassau St.

Factory at  
CHICAGO HEIGHTS, ILL.

**MANUFACTURERS OF STEEL RACKS, SHELVING, LOCKERS, BLUE-  
PRINT CABINETS AND TABLES**

## DURAND STEEL RACKS



Typical Arrangement Resulting from a Study of  
Storage Needs

Have solved the problem of systematic and efficient storage in many stock rooms. The flexible arrangement of shelves, made possible by holes punched vertically, three inches on centers, makes them adjustable; Durand construction permits the insertion of dividing partitions wherever wanted, making two or more compartments out of one; and if changing conditions make arrangement of racks unsuitable, DURAND RACKS can be knocked down and re-erected in a very little time. Their ability to stand heavy loads is guaranteed.

Both shelves and uprights are so punched that lengthwise

dividers may, if desired, be placed lengthwise in the center and crosswise dividers may be placed so as to divide the opening into approximately 6" spaces.

**Specifications**—End uprights are composed of two special angles and a ribbed sheet of No. 18 gauge steel. Intermediate uprights are composed of four special angles and a flat sheet. Shelves are made of 16-gauge sheets, and are flanged downward 1" at all edges and backward  $\frac{1}{2}$ ". The bin front is made from 16-gauge steel. Crosswise dividers are made of 18-gauge steel, folded flat on the front edge for stiffness. Backs are formed of a flat sheet, ribbed to give additional strength. Finished in Japan or Enamel, baked on at as high a temperature as the color will stand. This finish will not peel, crack or flake off or become sticky in hot weather.

All shelves are punched on 6" centers, so that if desired a 36" shelf can be divided into 6" compartments. Shelf can also be converted into a bin by use of detachable bin front. Front edges of shelves are punched to take  $\frac{1}{8}$ " continuous label holders.

### STANDARD SIZES OF PARTS

|                                      |   |                                  |                           |
|--------------------------------------|---|----------------------------------|---------------------------|
| <b>End and Intermediate Uprights</b> | Heights: 72", 84", 96", 102", 108", 120", 132", 144".<br>Depths: 12", 15", 21", 24", 27", 30", 36", 42", 48". |                                  |                           |
| <b>Shelves</b>                       | Widths: 24", 30", 36", 42", 48".<br>Depths: 12", 15", 18", 21", 24", 27", 30", 36", 42", 48".                 |                                  |                           |
| <b>Bin Fronts</b>                    | Heights: 3", 4", 6", 9", 12", 15".<br>Lengths: 24", 30", 36", 42", 48".                                       |                                  |                           |
| <b>Crosswise Dividers</b>            | Heights: 6", 9", 12", 15", 18", 24", 27", 30".<br>Lengths: 12", 15", 18", 21", 24", 27", 30", 36", 42", 48".  |                                  |                           |
| <b>Backs</b>                         | Heights: 72", 84", 96", 102", 108", 114", 120", 132", 144".<br>Widths: 24", 30", 36", 42", 48".               |                                  |                           |
| <b>Extension Fronts</b>              | <b>SHELVES</b>  | Widths: 24", 30", 36", 42", 48". | Depths: 6", 9", 12", 15". |
|                                      | <b>UPRIGHTS</b>   | Heights: 30", 36", 39", 42".     | Depths: 6", 9", 12", 15". |
|                                      | <b>COUNTER TOPS</b>   | Widths: 24", 30", 36", 42", 48". | Depths: 6", 9", 12", 15". |

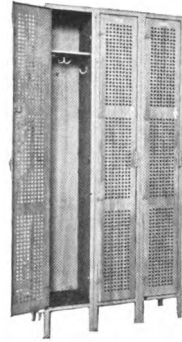
Send for complete Steel Rack Catalogue "E."

# DURAND STEEL LOCKER COMPANY

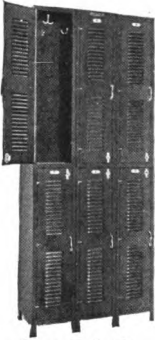
## DURAND STEEL LOCKERS

The demand for Durand Steel Lockers is based on the need of sanitary, fire-proof and indestructible clothes closets in stores, schools and factories. Managers of modern industrial plants have learned that one of the things which make their employees contented and orderly is an equipment of steel lockers.

For years we have been improving the details of construction of Durand Steel Lockers, such as locking device, hinge and accurate fitting together of parts which is the secret of perfect alignment of our lockers, that today it is the most practical factory locker made. Heavy sheet steel construction throughout, with welded angle frame. Doors perforated for ventilation as much as circumstances require. Made ready for padlocks, or fitted with good quality rim-key locks, master-keyed.



Type F. P.



Type F. L. D.

### Specifications

Our locker doors are made of No. 16 U. S. S. gauge, cold-rolled, pickled, annealed and patent leveled steel, hung in a steel angle frame. These angles are  $1\frac{1}{2} \times 1\frac{1}{2}$  inch, mitered and welded together at the corners by the Oxy-Acetylene flame, thus making the entire frame actually one piece of steel. The angles are machine polished before enameling to remove imperfections of surface.

The body of the locker is made of No. 21 U. S. S. gauge, cold-rolled, box annealed and roller leveled steel.

We perforate the doors in several different designs.

Doors are bolted by means of the Durand Multiple Locking Device, bolting near the top, near the bottom and in center on single tier lockers, and near the top and near the bottom on double tier lockers.

The locking device in turn is made so it can be controlled by a Yale flat key lock, or a combination lock, or, if preferred, by a padlock.

Our standard finishes are Black Japan and Olive Green Enamel, two coats, each baked on at a high temperature, insuring a durable, everlasting finish, which will not fade or crack.

### TYPE FLD

Six lockers  $12'' \times 12'' \times 36''$  in double tier. Yale rim key locks. (Illustrated.) This makes a very handsome locker.

| Standard Sizes |       |            |
|----------------|-------|------------|
| Width          | Depth | Height     |
| 12" x          | 12" x | 36" or 42" |
| 12 x           | 15 x  | 36 or 42   |
| 15 x           | 15 x  | 36 or 42   |
| 15 x           | 18 x  | 36 or 42   |
| 18 x           | 18 x  | 36 or 42   |

36" on 6" legs, equaling 78" over all.  
42" on 3" legs, equaling 87" over all. Special sizes to order.

Standard types L. D., S. D. and F. D. are double tier lockers with different styles of perforations. Sizes as above.

### TYPE FP

Three lockers  $12'' \times 12'' \times 72''$  in single tier. Yale rim key locks. (Illustrated.) Where a very open door is desired, so that the contents of the locker may be easily inspected, this type is excellent.

| Standard Sizes |       |            |
|----------------|-------|------------|
| Width          | Depth | Height     |
| 12" x          | 12" x | 60" or 72" |
| 12 x           | 15 x  | 60 or 72   |
| 15 x           | 15 x  | 60 or 72   |
| 15 x           | 18 x  | 60 or 72   |
| 18 x           | 18 x  | 60 or 72   |
| 18 x           | 24 x  | 60 or 72   |
| 24 x           | 24 x  | 60 or 72   |

Legs 6", making 66" and 78" overall.  
Special sizes to order.

Standard types L. S., F. L. S., and S. T. are single tier lockers with different styles of perforations. Sizes as above.

We will gladly prepare plans, specifications and estimates on an equipment of Steel Lockers or Steel Racks. Send for our complete Locker Catalogue "F."

# THE H. B. SMITH CO.

WESTFIELD, MASS.

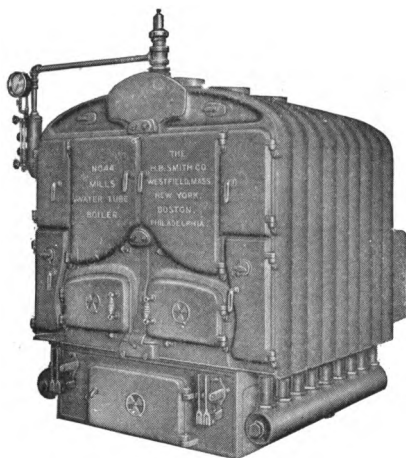
NEW YORK: 39 East Houston St.

PHILADELPHIA: 1225 Arch St.

BOSTON: 138 Washington St. No.

**BOILERS AND RADIATORS FOR STEAM AND WATER WARMING**

## MILLS WATER TUBE BOILERS



**No. 44 Steam Boiler**

**No. 24 Boiler**  
Width of Fire Pot 24 inches.  
Rated capacity { Steam 900 ft.  
to 2025 ft.  
Water 1500 to 3350 ft.

**No. 34 Boiler**  
Width of Fire Pot 34 inches.  
Rated capacity { Steam 2000 ft.  
to 5200 ft.  
Water 3300 ft. to 8575 ft.

**No. 44 Boiler**  
Width of Fire Pot 44 inches.  
Rated capacity { Steam 3600 ft.  
to 9000 ft.  
Water 5950 ft. to 14,850 ft.

**No. 48 Boiler**  
Width of Fire Pot 48 inches.  
Rated capacity { Steam 4800 ft.  
to 12,000 ft.  
Water 7925 ft. to 19,800 ft.

**Vertical Water Tubes.**

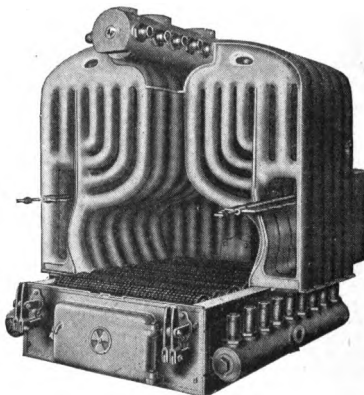
**Vertical Fire Travel.**

**Tested to 125 lbs. at Works.**

**Rapid Circulation.**

**Dry Steam.**

**Economy of Fuel.**



**No. 44 Boiler—Interior**



# THE H. B. SMITH CO.

## PRINCESS DIRECT RADIATORS



Single  
Column



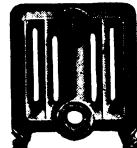
Two  
Column



Three  
Column



Five  
Column



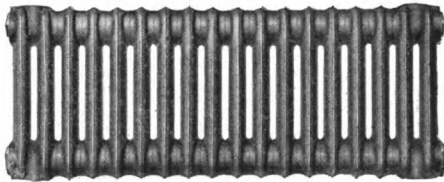
Five Column  
Window Height

Malleable Iron Push Nipple connection between Sections.

Test at Factory { Two tests 100 lbs. water.  
One test 80 lbs. steam.

One and two column Radiators, Sections 3" on centers.

Three and five column Radiators, Sections 3 1/4" on centers.



PRINCESS  
WALL  
RADIATORS



Flange Surface

### Indirect Radiators

FLANGE AND PIN EXTENDED  
SURFACE

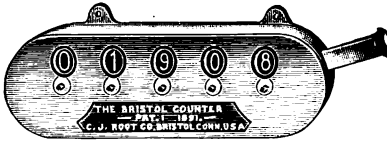
for

STEAM AND WATER WARMING.

# THE C. J. ROOT COMPANY

BRISTOL, CONN.

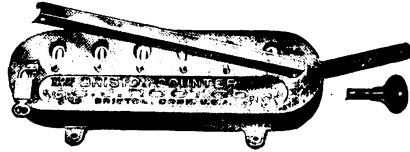
AUTOMATIC COUNTERS, WROUGHT BRASS HINGES, METAL STAMPINGS, ETC.



Bristol Counter

| No. | Size<br>Ins.          | Ship. Wt.<br>Lbs. | List<br>Price |
|-----|-----------------------|-------------------|---------------|
| 4   | 6 1/4 x 2 1/2 x 1 1/8 | 3 1/2             | \$8.00        |
| 5   | 8 x 2 1/2 x 1 1/8     | 3 3/4             | 10.00         |
| 6   | 9 1/4 x 2 1/2 x 1 1/8 | 4 1/2             | 12.00         |

Finish: Nickel Plated, Black Enameled, or Copper Oxidized.

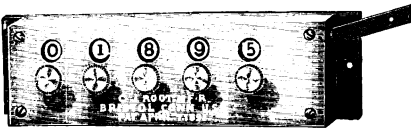


Bristol Counter with Lock Bar

| No. | List Price |
|-----|------------|
| 04  | \$8.00     |
| 05  | 10.00      |
| 06  | 12.00      |

Sizes, weights and finishes same as regular Bristol.

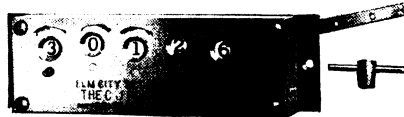
Number of Counter corresponds with number of figures.



"Elm City" Counter

| No. | Size<br>Ins.        | Ship. Wt.<br>Oz. | List<br>Price |
|-----|---------------------|------------------|---------------|
| 12  | 3 1/4 x 1 3/4 x 5/8 | 12               | \$4.50        |
| 13  | 4 x 1 3/4 x 5/8     | 15               | 6.00          |
| 14  | 4 3/4 x 1 3/4 x 5/8 | 18               | 8.00          |
| 15  | 5 1/2 x 1 3/4 x 5/8 | 21               | 10.00         |
| 16  | 6 1/4 x 1 3/4 x 5/8 | 24               | 12.00         |

Finish: Polished Brass, Whitened Dials.



"Elm City" Set-Back Counter

| No. | Size<br>Ins.        | Ship. Wt.<br>Oz. | List<br>Price |
|-----|---------------------|------------------|---------------|
| 113 | 4 x 1 1/4 x 5/8     | 15               | \$6.00        |
| 114 | 4 3/4 x 1 1/4 x 5/8 | 18               | 8.00          |
| 115 | 5 1/2 x 1 1/4 x 5/8 | 21               | 10.00         |
| 116 | 6 1/4 x 1 1/4 x 5/8 | 24               | 12.00         |

We also make the "ELM CITY" WITH LOCK BAR, the specifications of which are the same as above.

Number of Counter corresponds with number of figures.



No. 96 "Ro-Co" Counter  
Operated by Rotating Shaft, No Springs

|               | Size<br>Ins.          | Ship. Wt.<br>Lbs. | List<br>Price |
|---------------|-----------------------|-------------------|---------------|
| 5 Fig. No. 95 | 8 x 2 1/4 x 1 1/4     | 4                 | \$10.00       |
| 6 Fig. No. 96 | 9 1/2 x 2 1/4 x 1 1/4 | 5                 | 12.00         |

Black Enamel Finish.



No. 26 "Ro-Co" Counter  
Reciprocating Type

|             |                        |             |          |
|-------------|------------------------|-------------|----------|
| 6 Fig. Size | 8 x 2 1/4 x 1 1/4 ins. | Ship. Wt.   | 30 oz.   |
|             |                        | List Price, | \$12.00. |

In Nickel Plated or Copper Oxidized Finish

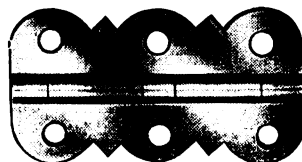
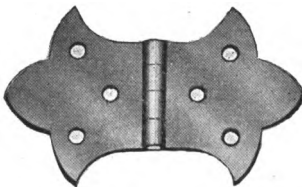
No. 55 "Ro-Co" Counter

| Fig. | No.         | Size                  | Ins. | List Price |
|------|-------------|-----------------------|------|------------|
| 4    | Fig. No. 54 | 4 3/4 x 1 1/2 x 1 1/4 | ins. | \$8.00     |
| 5    | " 55.       | 5 1/2 x 1 1/2 x 1 1/4 | "    | 10.00      |
| 6    | " 56.       | 6 1/4 x 1 1/2 x 1 1/4 | "    | 12.00      |

Made entirely without springs and has a nickel plated closed case.

WE ALSO MAKE A LINEAL COUNTER AND MEASURING MACHINE.  
PLEASE WRITE FOR CATALOG M AND DISCOUNT SHEET.

These counters can be shipped by Parcel Post at small expense.



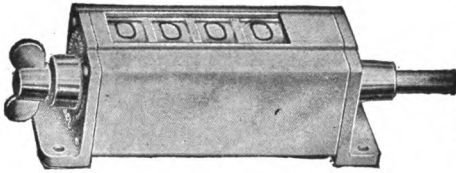
# THE VEEDER MANUFACTURING CO.

HARTFORD, CONN.

**MAKERS OF CYCLOMETERS, ODOMETERS, TACHOMETERS, TACHODOMETERS, COUNTERS, SPEED COUNTERS AND FINE DIE CASTINGS.**

*Veeder*

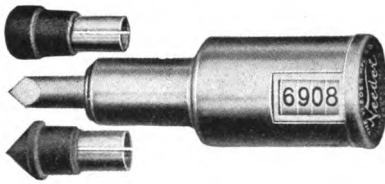
## SETBACK COUNTERS



A special feature of the set back counter is that one turn of the knob sets the counter at zero. These instruments are furnished in three types of gearing, namely

revolution, direct drive, and rotary ratchet. They can also be furnished with a lock and key instead of the reset knob, with this attachment the counter cannot be tampered with. The figures are large and can be easily read at a distance of ten feet. Veeder counters are of the highest grade workmanship, more compact than any other make and are positively dustproof.

## VEEDER CLUTCH SPEED COUNTER

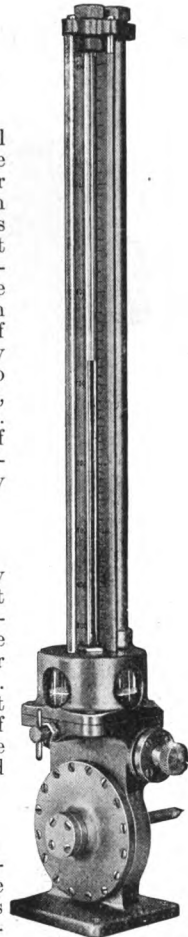


An absolutely accurate instrument for finding the revolutions per minute made by a shaft or any revolving part. A stop watch is not needed because of the clutch in the

counter. The straight reading index is easy to read and avoids errors.

## VEEDER FORM C TACHOMETER

The Form C Tachometer is a portable instrument for indicating revolutions per minute. The only moving part is the paddle wheel in the centrifugal pump. When the paddle is revolved the liquid is forced out of the pump and up the indicating tube.



Form C Tachometer

### CYCLOMETERS

For Bicycles and Motorcycles, to Register the Distance Traveled.

### ODOMETERS

For Automobiles and Horse-Drawn Vehicles, to Measure Distance Traveled.

### COUNTERS

To Register Revolutions or Reciprocating Movements. Twenty-five Styles.

### SPEED COUNTERS

For Finding the Revolutions per minute made by a Shaft or Any other Revolving Part.

### TACHODOMETERS

To Indicate the Speed and Record the Distance Traveled, both Trip and Total. For use on Automobiles, Locomotives and Electric Railway Cars.

### TACHOMETERS

To Indicate Speed in Revolutions per Minute of Shafts, Generators, Motors, etc.

### FINE DIE CASTINGS

Where Large Numbers of Absolutely Uniform Small Parts are Required.

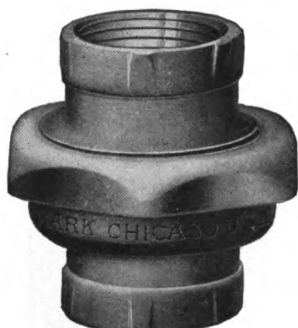
Every mechanical engineer should have a copy of our complete catalogue. It will be supplied free upon receipt of application.

# THE MARK MANUFACTURING CO.

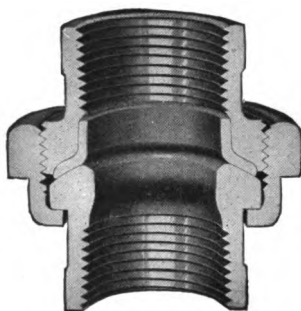
EVANSTON, ILL.

ZANESVILLE, OHIO

**MAKERS OF WROUGHT PIPE AND COUPLINGS, BOILER TUBES, ELECTRIC WIRE CONDUIT, WELL CASING, WELL POINTS, PUMP AND WELL CYLINDERS, WELL STRAINERS, WELL VALVES AND TOOLS, PIPE CUTTERS, VISES, THREADING DIES AND PUMP AND WELL SUPPLIES.**



Patents Pending



Patents Pending

## THE MARK COLD DRAWN STEEL PIPE UNION

**Leakless — Rustless — Different**

**Sherardized after threading to prevent Rusting, Corroding, Freezing.**

This new type of pipe union consists of male and female ends, and coupling nut, all Cold Drawn from rolled steel.

### It will not leak, break or corrode—BECAUSE:

1. It will expand and contract in *exactly the same degree* as steel pipe with which it is used, consequently it is not subject to leakage at threads, which is unavoidable where malleable and brass unions are used with steel pipe.

2. It is entirely free from blow holes, and sand holes, defects common to all types of unions made of malleable iron and cast brass.

3. It has a "densified" steel seat cushioned against a soft brass seat ring.

4. The threads are accurately cut, and have the same taper as the pipe.

5. It is designed to carry high pressure as well as low, and all sizes are equally strong.

6. All surfaces are Sherardized, and therefore, non-corrosive.

### SIZES AND LIST PRICES

| Pipe Size... | ½    | ¾    | 1    | 1¼   | 1½   | 2     | 2½    | 3     |
|--------------|------|------|------|------|------|-------|-------|-------|
| Steel.....   | .50  | .70  | .95  | 1.30 | 1.80 | 2.50  | 4.00  | 6.00  |
| Brass.....   | 2.00 | 3.00 | 4.00 | 5.00 | 7.00 | 10.00 | 12.00 | 15.00 |

# DETROIT LUBRICATOR COMPANY

DETROIT, MICH.

**MANUFACTURERS OF LUBRICATORS, FORCE FEED OILERS, OIL AND GREASE CUPS, AIR AND GAUGE COCKS, PRIMING CUPS, BALANCED THROTTLE VALVES, WATER GAUGES, POP SAFETY VALVE, FUSIBLE PLUGS AND RADIATOR VALVES.**

## DETROIT SIGHT FEED LUBRICATORS

Detroit Lubricators are made in a sufficient variety of styles and kinds to properly lubricate the valves and cylinders of all types of steam engines, steam pumps, gas engines, air compressors, etc. The complete line includes 146 styles and sizes of lubricators—one for every kind of service.



Standard Lubricator

## IMPROVED STANDARD LUBRICATOR

Double Connection

For use on all kinds of steam engines, steam pumps, etc.

Installed with both connections between the boiler and the throttle.

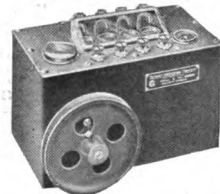
Finished in polished brass or nickel plated.

| Size.....                       | $\frac{1}{8}$ Pt. | $\frac{1}{2}$ Pt. | 1 Pt.         | 1 Qt.         | $\frac{1}{2}$ Gal. | 1 Gal.        |
|---------------------------------|-------------------|-------------------|---------------|---------------|--------------------|---------------|
| Pipe Thread on Support Arm..... | $\frac{1}{2}$     | $\frac{1}{2}$     | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{3}{4}$      | $\frac{3}{4}$ |

## DETROIT FORCE FEED OILERS

Detroit Force Feed Oilers are designed for the mechanical lubrication of gas and gasoline engines, air compressors, etc. The advantages of this system of lubrication are: cool, clean oil forced by mechanical pressure and in quantities as needed to the proper point to be lubricated, the elimination of the possibility of injury from running dry or carbon deposits, and very little attention from the operator as there is only one tank to fill.

They are made with 1 to 30 feeds and corresponding capacities of 3 to 18 pints, using a standard tank,  $4\frac{3}{8}$ " wide and 5" high. Special models for gas tractors, marine and stationary engines, automobiles, commercial trucks and aeronautical motors.



Four Feed Force Feed Oilier

## DETROIT LOCOMOTIVE LUBRICATORS

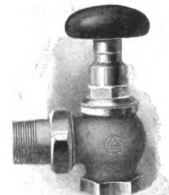
Detroit Locomotive Lubricators are thoroughly suited to fulfill all the requirements of every style of locomotive from the saturated simple engine to the most modern superheated Mallet. The No. 22 Type of Bullseye Lubricators is recommended as possessing improvements and refinements made desirable by the needs of modern locomotive practice, resulting in a low cost of maintenance and economy in oil. Made with from one to eight feeds.



Three Feed Locomotive Lubricator

## DETROIT RADIATOR VALVES

Detroit Radiator Valves embody in their design the results of years of experience in the manufacture of all kinds of valves for all styles of heating installation. The Detroit Packless Valve fulfills the need for a radiator valve that will not leak around the stem nor need repacking. Its construction makes it perfectly adapted also for use in vacuum systems where tightness is essential.



Packless Valve

## HYDRAULIC OIL STORAGE CO.

HOME OFFICES AND SHOPS, 18 ALBANY ST., N. Y. C., N. Y.

BOSTON

LONDON, ENG. 3 Kingway, W. C.

BRANCHES

PHILADELPHIA

BALTIMORE

DETROIT, MICH.

LOS ANGELES, CAL.

**OIL HANDLING EFFICIENCY ENGINEERS, MANUFACTURERS,  
INSTALLORS AND DISTRIBUTORS OF OIL STORAGE SYSTEMS**

Gasoline and Fuel Oil Storage Systems for feeding all types of engines, boilers, forges, etc.

Gasoline Storage Systems for garages and factories. Lubricating, Cylinder and Kerosene Oil Systems.

Engine Oil Storage Systems for storing, feeding, returning and filtering Lubricating Oils.

Oil Storage Systems for railroad and manufacturing purposes.

Benzine Systems for modern Dry Cleaners.

Multiple Floor Oil Delivery Systems.

Gasoline and Oil Separators, "Suction" and "Over-flow" Separators.

### STORAGE SYSTEMS

Gasoline or Oil delivered directly to any point or points under constant pressure and steady flow.

No water drawn with fluid.

No sediment or dirt in delivered fluid.

No vent pipe to tank.

No evaporation.

No deterioration.

No gases.

No possibility of explosion.

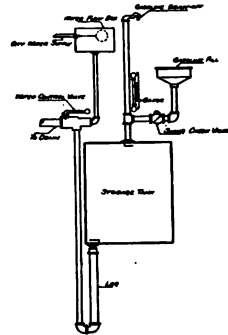
Automatic operation.

No pumps, syphons or air pressure.

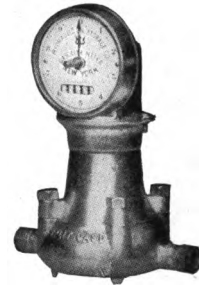
No reciprocating or complicated parts to maintain.

No multiplicity of valves to seat or leak.

Listed by National Board of Fire Underwriters with highest rating for designated purpose.



Hydraulic Storage System



Gasoline Meter

### METERS

**Oil Delivery Meters, Fill Line  
Meters, Gasoline Meters.**

Guaranteed by the Stamp of the Bureau of Weights and Measures of New York City. Accurate on both large and small rates of flow. Gasoline and Oil measured when delivered to and when taken from the storage tank.

### GASOLINE AND OIL

#### SEPARATORS

**For Separating Gasoline and Oil from Drain Lines**

For use in connection with sewage disposal plants.

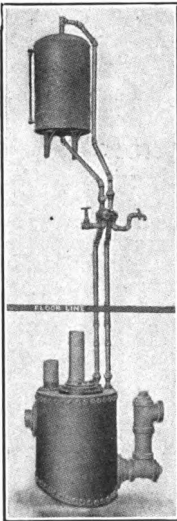
Will keep cesspools and dry wells free from oil and grease when installed in the drain line.

Designed to meet garage regulations of New York City.

Prevent gasoline and oil from entering main sewer when installed on the drain line.

Descriptive Bulletins will be furnished upon request, also list of installations of large factories and garages who have installed the Hydraulic System. Many of these have adopted the Hydraulic after having first tried out the other methods.

The services of our Engineers are at your disposal without obligation.



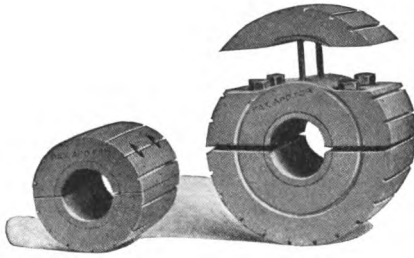
Gasoline and Oil  
Separators

## GEO. L. ESTES

CUBA, NEW YORK, U. S. A.

**MANUFACTURER OF WOOD SPLIT PULLEYS, ESTES KEYLESS COMPRESSION SHAFT COUPLING**

### THE PREMIER WOOD PULLEY



Patent Applied for

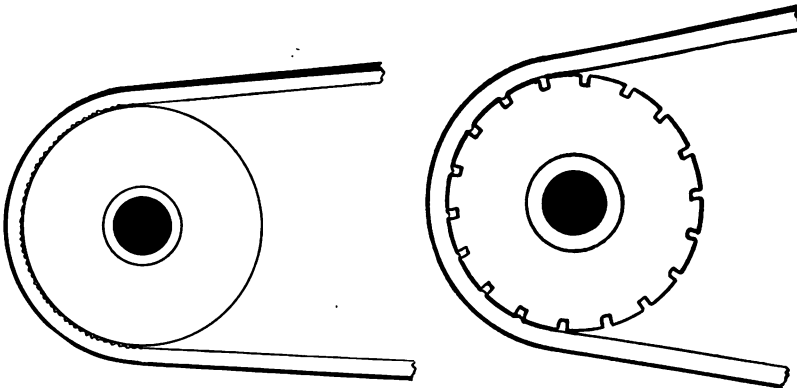
The new Pulley which will absolutely transmit 50% more power than any other pulley.

50% more adhesion of the belt.

Elimination of slippage and reduced tension.

By providing the traction surface with means for air escape, and for taking up the compression ridges which form inside of every belt.

Positively no injury to the belt from contact with the edge of grooves.



Ordinary Pulley and Belt showing Compression Ridges.

Premier Pulley showing how the Compression Ridges are Absorbed.

### Jobbers and Dealers Attention

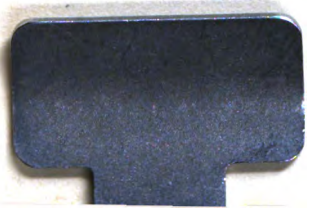
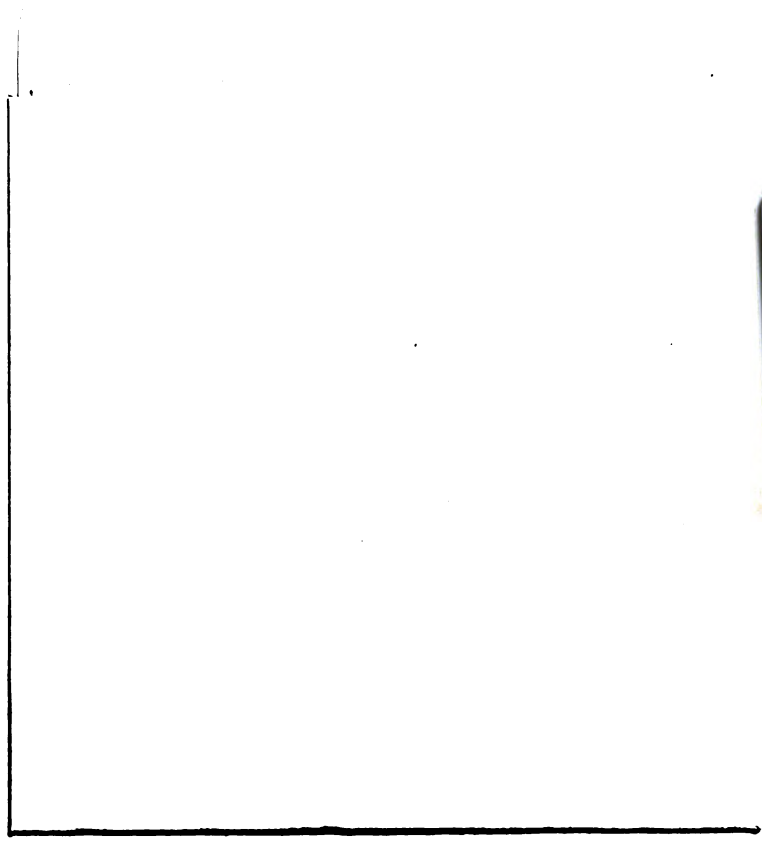
Here is an exceptional opportunity to get something new which is bound to be a seller. Every Master Mechanic in the Country will demand the Premier Pulley, as it will give them more power at a lesser cost than any pulley made. **SECURE YOUR TERRITORY AT ONCE.**











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